

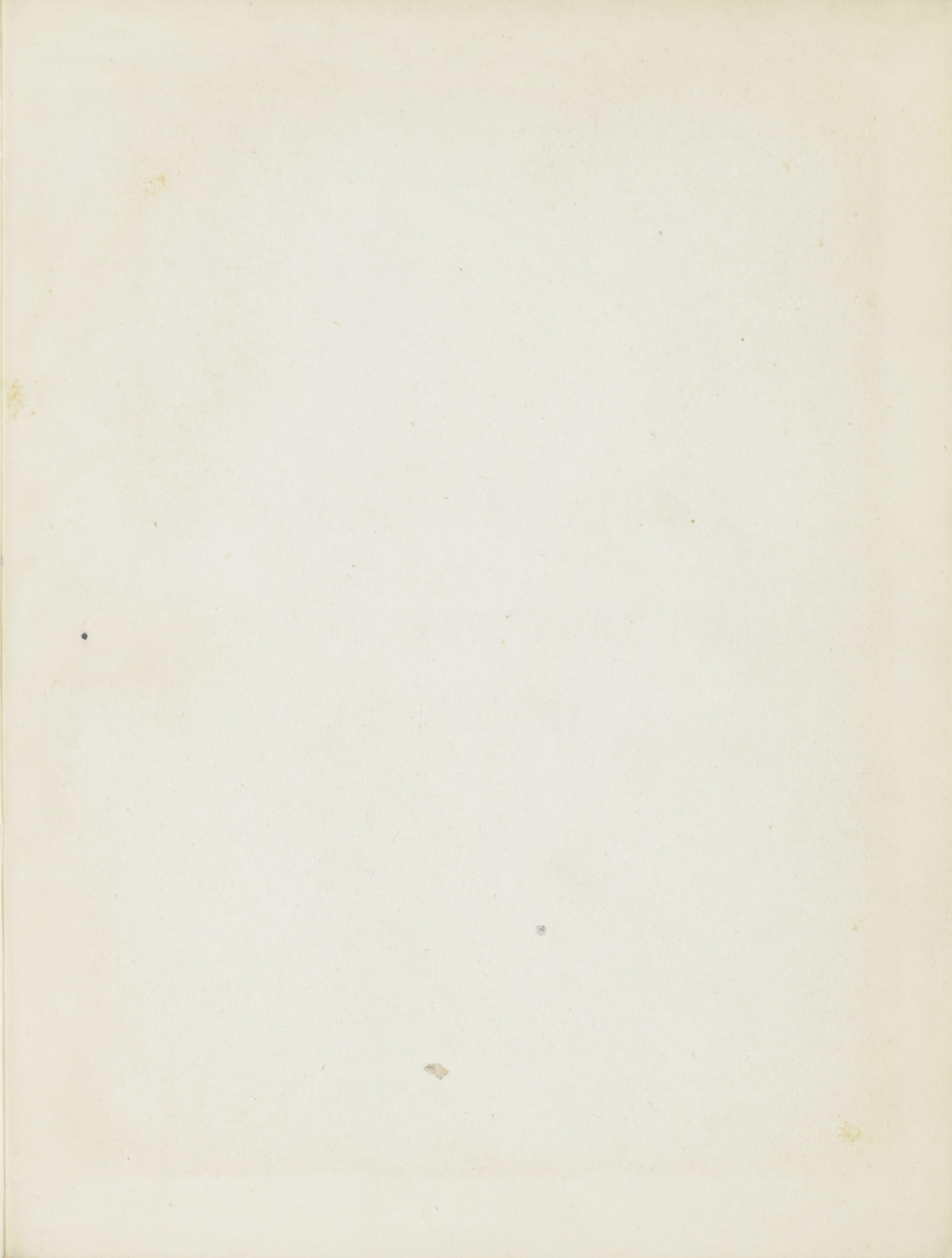
LLOYD'S REGISTER
OF
BRITISH AND FOREIGN
SHIPPING

RULES AND REGULATIONS

1888-9

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LLOYD'S REGISTER
OF
BRITISH AND FOREIGN
SHIPPING.

PUBLICATIONS ISSUED BY THE COMMITTEE OF LLOYD'S REGISTER.

LLOYD'S REGISTER OF SHIPPING, issued annually on the 1st of July. This Book contains the Names, CLASSES, and detailed information concerning the Vessels classed by Lloyd's Register and the Underwriters' Registry for Iron Vessels; and in addition the Names, Dimensions, and other particulars of all Vessels of 100 tons and upwards registered in the United Kingdom, and of many Ships of large tonnage owned abroad.

In the Appendix will be found a list of Owners of Ships recorded in the Register Book; details of the Dry and Wet Docks, Floating Docks, Pontoons, Patent Slipways, Tidal Harbours, Quays, &c., at all Ports in the World; a list of Telegraphic Addresses of all firms, &c., connected with Shipping (with the Telegraphic Codes severally employed) so far as ascertained, &c.

A list is also printed in the Appendix of the Members and subscribers of Lloyd's, and of the Agents to Lloyd's.

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THE RULES FOR THE BUILDING AND CLASSIFICATION OF SHIPS are also published separately.

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UNIVERSAL REGISTER, issued annually on the 1st of April. This work contains, as far as possible, particulars of EVERY SEA-GOING VESSEL (including Yachts) in the world of 100 tons and upwards; an alphabetical LIST OF ALL SHIPOWNERS, with their addresses and the names and tonnages of their vessels; a list of TELEGRAPHIC ADDRESSES of all firms, &c., connected with Shipping (with the Telegraphic Codes severally employed) so far as ascertained; particulars of the WAR VESSELS BELONGING TO ALL NATIONS; details of the DRY and WET DOCKS, FLOATING DOCKS, PONTOONS, PATENT SLIPWAYS, TIDAL HARBOURS, QUAYS, ETC., at all ports in the world, together with various statistical and other useful information.

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LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

UNITED WITH THE
UNDERWRITERS' REGISTRY FOR IRON VESSELS IN 1885.

From 1st July, 1888, to the 30th June, 1889.

The REGISTER,—which is printed solely for the information of Merchants, Shipowners, Underwriters, and others, being Subscribers or Members,—contains, in addition to the names, class, and other useful particulars relating to vessels classed by the Society, and those classed by the Underwriters' Registry for Iron Vessels, the names, dimensions, &c., of *all* vessels of 100 tons and upwards registered in the United Kingdom, some of which, although not classed by the Society, may be classed elsewhere.

The conditions regulating the classification of vessels in the REGISTER are contained in the Society's Rules.

The KEY to the REGISTER precedes the List of Vessels.



OFFICE: 2, WHITE LION COURT, CORNHILL, LONDON

1888.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

UNITED WITH THE

UNDERWRITERS' REGISTRY FOR IRON VESSELS IN 1885.

ESTABLISHED 1834.

NOTICE.

The Register, which is printed solely for the use of Subscribers, now contains the respective characters and full particulars of Vessels which are classed by LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, and of those which are classed by the UNDERWRITERS' REGISTRY FOR IRON VESSELS.

It also contains the Names, Dimensions, and other useful particulars of *all* Vessels of 100 tons and upwards registered in the United Kingdom, some of which, although not classed in this Society's Register, may be classed elsewhere.

The conditions regulating the Classification of Vessels in the Register are contained in the Rules.

The Key to the Register precedes the List of Vessels.

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LA ROCHELLE (Address, 6, Place de la Préfecture)	Garnier, André Louis
MARSEILLES	Ship and Engineer Surveyor (Address 5, Rue Suffren)	Westerman, Francis
NANTES (Address, 8, Rue de l'Héronnière)	Guibert, Auguste L.
	Assistant Ship and Engineer Surveyor (Address, 20, Quai de l'Ile Gloriette)	L'heureux, J.

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

ROCHEFORT	<i>Ship and Engineer Surveyor</i>	
ST. MALO	<i>with a District extending from Brest to Cherbourg inclusive</i> (Address, 82, Rue d'Asfeld)	} Gallais, Jean

SPAIN AND PORTUGAL.

ALICANTE	... ..
BARCELONA	<i>Ship and Engineer Surveyor</i> (Address, Portico Xifré 10, 1º)	} Browne, J. J.
BILBAO	... .. (Address, Muelle de Ripa, 3)	De Bareno, German
CADIZ	<i>Ship and Engineer Surveyor</i> (Address, 25, Aduana)	Cochrane, James
CARTHAGENA	<i>Ship and Engineer Surveyor</i>	Sanchez, José Hernandez
HUELVA	<i>Ship and Engineer Surveyor</i>	Langdon, William
LISBON	<i>Ship and Engineer Surveyor</i> (Address, Rua do Jardim do Tabaco 33, 22º)	} Westwood, J.
MALAGA	<i>Ship and Engineer Surveyor</i>	Lappe, Enrique
OPORTO	... .. (Office, Rua do Reboreira, 13, 2º)	Dos Santos, J. M.
	<i>Engineer Surveyor</i>	Ennor, C. J.
VALENCIA	... ..

GIBRALTAR.

GIBRALTAR	<i>Ship and Engineer Surveyor</i> (Address, Government Dock Yard)	} Hook, James
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ITALY AND AUSTRIA.

ANCONA	Emett, F. G.
GENOA (Office, Via S. Luca No. 2, Prima Scala)	Schiaffino, Francesco
	<i>Engineer Surveyor for Genoa and Leghorn</i> (Address, 5, Rue Suffren, Marseilles)	} Westerman, Francis
LEGHORN	... ..	Gori, Costantino
MESSINA	... ..
NAPLES	... ..
PALERMO	... ..
TRIESTE	<i>with District of the Austro-Hungarian Coast, also Venice</i> (Office, Via Carradori No. 1, Trieste)	} Florio, Elias
	<i>Engineer Surveyor for Trieste District</i>	Schnabl, Frederick
	<i>Assistant Surveyor at Fiume</i>	Bonetich, Ignazio
	<i>Ditto at Lussino</i>	Tarrabocchia, Antonio E.
	<i>Ditto at Venice</i>	Fabro, Matteo

MALTA.

MALTA	<i>Ship and Engineer Surveyor</i>	Wright, C. H.
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UNITED STATES.

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WEST INDIES.

SOUTH AMERICA

Crocker, F.

Ivol, C. C.

Burke, F. M.
Weston, A. R.
Campbell, J.

Stephen, W.
Airth, Alexander

Cowin, John

Brown, G. B.
McLaggan, C.
Clarke, A. C.

} Moir, James

McKellar, D.

Donnan, J.

} Hughes, J.

Campbell, P.

Winter, R. R.

Fittock, Charles

Park, Robert

Campbell, C.

} Sawyer, Frederick H.

Vogel, W.

Vader, P.

Burnie, Edward

Johnston, Andrew

FOREIGN AND COLONIAL SURVEYORSHIPS—continued.

CHINA AND JAPAN (continued).

KOBÉ HIOGO	Ship and Engineer Surveyor and Engineer Surveyor for	}	Ellerton, James
	<i>Yokohama</i>		
NAGASAKI	(See KOBÉ)		
SHANGHAI	... ..		Warburg, C. G.
	<i>Engineer Surveyor</i>		Sonne, H.
YOKOHAMA	... ..		Efford, John J.
	<i>Engineer Surveyor</i>		Ellerton, Jame
	(residing at Kobé, Hiogo)		

AUSTRALIA, TASMANIA, AND NEW ZEALAND.

ADELAIDE, S. A.	... ..	Begg, William
AUCKLAND, N.Z.	... ..	Clayton, M. T.
	<i>Engineer Surveyor</i>	Lodder, W.
BRISBANE, QUEENSLAND	... ..	Brown, William B.
CHRISTCHURCH, N.Z.	... ..	Ticehurst, Robert
DUNEDIN, N.Z.	... ..	Thomson, W.
HOBART, TASMANIA	... ..	Macmillan, Donald
INVERCARGILL, N.Z.	... ..
MELBOURNE, VICTORIA	... ..	Watson, William
NAPIER, N.Z.	... ..	Davidson, A.
NELSON, N.Z.	... ..
NEW PLYMOUTH, N.Z.	... ..
NEWCASTLE, N.S.W.	... ..	Brooks, Thomas
	<i>Engineer Surveyor</i>	Rorison, James
SYDNEY, N.S.W.	... .. (Office, 22, Bridge Street, Sydney)	Pockley, Robert F.
	<i>Engineer Surveyor</i>	Pollock, R.
TOWNSVILLE	... ..	Grainger, T. L.
WELLINGTON, N.Z.	... ..	Bendall, William

2, White Lion Court, Cornhill, London,
22nd June, 1887.

LIST OF SURVEYORSHIPS OF LLOYD'S REGISTER.

(ALPHABETICALLY ARRANGED).

THE SURVEYORS AT THE PORTS MARKED * ARE EXCLUSIVELY THE OFFICERS OF THE SOCIETY,
AND ARE NOT PERMITTED TO ENGAGE IN ANY OTHER BUSINESS OR EMPLOYMENT WHATSOEVER.

	Benjamin Martell, Esq., <i>Chief Surveyor of Lloyd's Register</i>	William C. Davey, <i>Principal Surveyor for London District.</i>
	Harry J. Cornish,	Cooper, G. P.
	Thomas Edwards,	Jordan, Chas. H.
	William Parker, Esq., <i>Chief Engineer Surveyor of Lloyd's Register.</i>	Mares, Geo. R.
*LONDON	David Purves, <i>Assistant to Chief Engineer Surveyor</i>	Read, Thomas C.
		Tierney, E. J.
		Truscott, James H.
		Warren, Thomas S.
		Wilson, Allison B.
	<i>Engineer Surveyors</i>	{ Stromeayer, Charles E.
		{ Wilkinson, George E.
		{ Gray, T. L.
	<i>Ship and Engineer Surveyors</i>	{ Jones, A. L.
		{ Ritson, M.
		Hunter, David S.
	<i>Draughtsman</i>	Heck, John H.
*ABERDEEN	<i>Ship and Engineer Surveyor</i> (<i>Office, 29, Regent Quay</i>)	Begg, William
ADELAIDE, S.A.	... ..	Brown, G. B.
AKYAB	... ..	McLaggan, C.
	<i>Engineer Surveyor</i>	Burke, F. M.
ALGIERS, ORAN, AND CONSTANTINE	... .. (<i>residing at Algiers</i>)	
ALICANTE	... ..
AMOY	... ..
*AMSTERDAM	{ <i>Ship and Engineer Surveyor for Amsterdam; also</i> <i>Engineer Surveyor for the Ports in Holland ...</i> }	Ollefen, W. F. D. van
ANCONA	... ..	Emett, F. G.
ANTWERP	... .. (<i>Office, Rue d'Amsterdam</i>)	Paasch, Heinrich
	<i>Engineer Surveyor for the Belgium District</i> (<i>residing at Antwerp</i>) }	Demblon, Francis
ARENDAL	... ..
AUCKLAND, N.Z.	... ..	Clayton, M. T.
	<i>Engineer Surveyor</i>	Lodder, W.
BAHIA	<i>Ship and Engineer Surveyor</i>	Woods, A. R. T.
BALTIMORE	... .. (<i>Office, 11, South Gay Street</i>)	Sanford, Edward H.
	<i>Engineer Surveyor</i>	Wells, Richard
*BANGOR	... .. (<i>Office, 5, Glan Ducr Terrace</i>)	Devonald, Thomas
BARCELONA	<i>Ship and Engineer Surveyor</i> (<i>Address, Portico Xifré 10, 1°</i>) }	Browne, J. J.

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*BARROW	<i>Ship and Engineer Surveyors also Engineer Surveyors for Whitehaven, &c. (Office, 8, Strand)</i>	...	...	...	...	...	...	{ Ritchie, Duncan Dykes, J.
BATAVIA	...	...	...	...	...	...	...
BAYONNE	...	...	...	...	...	...	...
*BELFAST	...	...	...	...	...	...	...
	... (Office, Victoria Chambers, Waring Street)	...	...	...	...	...	...	Turpin, James
	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	Maxton, James
BERGEN	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	Houglund, E.
*BIDEFORD	...	...	...	...	...	...	...	Fittock, Charles
BILBAO	...	...	...	...	...	...	...	De Bareno, German
	(Address, Muella de Ripa, 3)	...	...	...	...	...	...	Clarke, A. C.
BOMBAY	...	...	...	...	...	...	...
	<i>Engineer Surveyor</i>	...	...	...	...	...	...	{ Moir, James
	(Address, Bombay Steam Navigation Co., Frere Road, Bombay)	...	...	...	...	...	...	Vandereruyce, Jules
BORDEAUX	...	...	...	...	...	...	...
	... (Address, 16, Rue Blanc Dutrouille)	...	...	...	...	...	...	{ Donzelle, A.
	<i>Engineer Surveyor</i>	...	...	...	...	...	...
	(Address, 108, Rue du Palais Gallien)	...	...	...	...	...	...	{ Shaw, Oliver L.
BOSTON	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...
	(Office, 24, White Street, East Boston)	...	...	...	...	...	...	{ Thomsen, F. H. T.
BREMERHAVEN	<i>Ship and Engineer Surveyor for Weser district</i>	...	...	...	...	...	...
	(Office, Burgermeister Smidt Strasse No. 13)	...	...	...	...	...	...	Brown, William B.
BRISBANE, QUEENSLAND	...	...	...	...	...	...	...
*BRISTOL	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	{ Coomber, R. W.
	(Office, 53, Queen's Square)	...	...	...	...	...	...	Hunter, W. E.
BUENOS AYRES	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	Cochrane, James
CADIZ	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	McKellar, D.
	(Address, 25, Aduana)	...	...	...	...	...	...	Stephen, W.
CALCUTTA	...	...	...	...	...	...	...
	(Office, 7, Old Post Office Street)	...	...	...	...	...	...	Andrew K. Hamilton
CAPE TOWN	...	...	...	...	...	...	...	<i>Principal Surveyor</i>
*CARDIFF	...	...	...	...	...	...	...	Rule, J. G. G.
	<i>Ship and Engineer Surveyors</i>	...	...	...	...	...	...	{ Ashton, H. H.
		...	...	...	...	...	...	Fargie, W. A.
		...	...	...	...	...	...	Hindmarsh, G. L.
		...	...	...	...	...	...	Mancor, J. H.
CARLSRONA	...	...	...	...	...	...	...
CARTHAGENA	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	Sauche, José Hernandez
CETTE	...	...	...	...	...	...	...
*CHANNEL ISLANDS	...	...	...	...	...	...	...	Chinneck, T. J.
	(residing at St. Helier's, Jersey)	...	...	...	...	...	...
CHARLESTON	...	...	...	...	...	...	...	Campbell, C.
CHERIBON	...	...	...	...	...	...	...	Ticehurst, Robert
CHRISTCHURCH, N.Z.	...	...	...	...	...	...	...	Donnan, J.
COLOMBO	...	...	...	...	...	...	...	Admiral Woods Pasha.
CONSTANTINOPLE	...	...	...	...	...	...	...	Warren, G. R.
	<i>Engineer Surveyor</i>	...	...	...	...	...	...

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued*

COPENHAGEN	<i>Ship and Engineer Surveyor</i> (Office, 18, Fredericiagade, K.) (For Assistant Surveyors to Mr. Kindler, see Geographical List.)								Kindler, P. Fred.
CRONSTADT	<i>Ship and Engineer Surveyor</i> ... (Address, Officerskaia, No. 57, St. Petersburg)								} Wessblad, A.
DEMERRARA	...	...	...	...	...	...	...	Duncan, Alexander	
DIEPPE	...	...	...	...	...	...	...
*DUBLIN	...	...	...	...	(Address, 110, Seville Place)			Franklin, J.	
*DUNDEE	<i>Ship and Engineer Surveyor</i> (Office, 54, Commercial Street)								Keydell, A. E.
DUNEDIN, N.Z.	...	...	...	...	...	...	...	Thomson, W.	
DUNKIRK	...	...	...	...	...	...	...	De Wulf, H.	
*FALMOUTH	...	...	...	...	(Office, 2, Park Terrace)			Sandry, T. H.	
	<i>Engineer Surveyor for Falmouth</i> ...								Dyer, C. M. B.
FIUME (See TRIESTE).									
FOOCHOW	...	...	...	...	...	...	...
GALATZ and BRAILA...	...	...	...	...	(residing at Braila)			Archbold T. H.	
GEFLE	...	...	...	...	...	...	...
GENOA	...	...	(Office, Via S. Luca No. 2, Prima Scala)			Schiaffino, Francesco			
	<i>Engineer Surveyor</i> ... (residing at Marseilles)								Westerman, Francis
GIBRALTAR	<i>Ship and Engineer Surveyor</i> ... (Address, Government Dock Yard)								} Hook, James
									Burney, Charles E.
									Courtier-Dutton, W. T.
									Dawkins, John
									Dodd, Thomas J.
									Dove, Herbert W.
									Edwards, Charles
									Hand, Henry
									Johnstone, W.
									Roberts, J. T.
									Thearle, S. J. P.
									Thomson, Joseph
	<i>Engineer Surveyors</i> ...								} Mollison, James
	<i>Ship and Engineer Surveyors</i> ...								} Findlay, J. T.
									Sibun, W.
	<i>Inspector of Forgings for the Clyde District</i> ...								Newcomb, George
GOTHENBURG	<i>Ship and Engineer Surveyor</i> ... (Address, Lazarettsgatan No. 101 b)								} Möller, Carl Axel
*GREENOCK	...	...	...	...	(Office, 13, Hamilton Street)			Fowling, C.	
	<i>Ship and Engineer Surveyor</i> ...								Heron, Andrew C.

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

GUERNSEY	... ..
HALIFAX, N.S.	... .. <i>Engineer Surveyor</i>	Hunter, David McDonald, A.
HAMBURG	... .. <i>Engineer Surveyor</i> <i>Assistant Surveyor at Rostock</i>	(Office, Steinhöft No. 3) (Office, Stubbenhuk, No. 20) Padderatz, Emil Berendt, M. Cordes, W.
HANGCHOW	... ..
*HARTLEPOOL	(Office, Dock Office Buildings, Victoria Terrace, West Hartlepool) <i>Engineer Surveyor</i> <i>Ship and Engineer Surveyors</i>	{ Charles Davidson, Principal Surveyor. Andrews, William Buchanan, C. Phillips, Thomas Wilkinson, Henri Williams, H. M. Stoddart, J. E. Austin, W. R. Buchanan, J. H. Morrison, W.
HAVRE	<i>Ship and Engineer Surveyor</i> (Address, 25, Place de l'Hôtel de Ville)	{ Le Laidier, A.
HELSINGFORS	<i>Ship and Engineer Surveyor</i> (Address, 23, Brunnsparke)	{ Kolster, R.
HOBART, TASMANIA	... ..	Macmillan, Donald
HONG KONG	... .. <i>Engineer Surveyor</i> (Address, Lee Yuen Sugar Refinery)	Burnie, Edward Johnston, Andrew
HUELVA	<i>Ship and Engineer Surveyor</i>	Langdon, William
*HULL	(Office, Bank Chambers, Land of Green Ginger, Hull) <i>Ship and Engineer Surveyor</i>	Williamson, Robert Innes, James
INVERCARGILL, N.Z.	... ..
*IPSWICH	... .. (Address, 35, Lower Orwell Street)	Robertson, Ebenezer J
KINGSTON, JAMAICA	... ..
KOBÉ, HIOGO	<i>Ship and Engineer Surveyor, and Engineer Surveyor for Yokohama</i>	Ellerton, James
KURRACHEE	<i>Ship and Engineer Surveyor</i> (Address, Persian Gulf Telegraphs, Manora, Kurrachee)	{ Hughes, J.
LA ROCHELLE	... .. (Address, 6, Place de la Préfecture)	Carnier, André Louis
LEGHORN	... ..	Gori, Costantino
*LEITH	... .. (Office, 56, Constitution Street) <i>Ship and Engineer Surveyor</i>	Paulsen, William Darling, William J.

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued*.

LISBON	<i>Ship and Engineer Surveyor</i>	(Address, Rua do Jardim do Tabaco 33, 22°)	Westwood, J.
			John F. Light, <i>Secretary and Principal Surveyor.</i>
*LIVERPOOL	(Office, 12, Oriel Chambers)	Champness, Edward C.
			Lawrence, John
			Moverly, William
			Rutherford, John
			Wheeler, C. Edward
	<i>Engineer Surveyors</i>		McGregor, Peter
	<i>Ship and Engineer Surveyor</i>		Milner, G. A.
LUSSINO (See TRIESTE).			Hamilton, Andrew K.
LYNN		
MALAGA	<i>Ship and Engineer Surveyor</i>		Lappe, Enrique
MALTA	<i>Ship and Engineer Surveyor</i>		Wright, C. H.
MANILA	<i>Ship and Engineer Surveyor</i>		Sawyer, Frederick H.
MARSEILLES	<i>Ship and Engineer Surveyor</i> (Address, Rue Suffren 5)		Westerman, Francis
MAURITIUS	(residing at Port Louis)	Cowin, John
MELBOURNE, VICTORIA		Watson, William
MEMEL		
MESSINA		
MILFORD HAVEN	(Address, 15, Neyland Terrace, Neyland)	Harris, W.
MONTÉ VIDEO		Crocker, F.
MONTREAL	(Address, Port Warden's Office)	Shaw, J. G.
MOULMEIN	<i>Ship and Engineer Surveyor</i>		Campbell, P.
NAGASAKI	(residing at Kobé, Hiogo)	Ellerton, James
NANTES	(Address, Rue de l'Héronnière 8)	Guibert, Auguste L.
	<i>Assistant Ship and Engineer Surveyor</i>		L'heureux, J.
	(Address, 20, Quai de l'Île Gloriette)		Davidson, A.
NAPIER, N.Z.		
NAPLES		
NELSON, N.Z.		
NEW ORLEANS		Turley, J. K.
NEW PLYMOUTH, N.Z.		
*NEW YORK	<i>Principal Surveyor for the United States</i>	(Office, Kemble Buildings, Whitehall Street)	Congdon, Thomas
			Henry J. Boolds, <i>Principal Surveyor.</i>
			Cooke, Thomas H.
			McNeil, James
			Scullard, J. W.
			Sharpe, W. L.
			Shilston, Thomas
			Sibun, James
			Skentelbery, C.
*NEWCASTLE-ON-TYNE	(Office, 3, St. Nicholas Buildings)	

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

LISBON	<i>Ship and Engineer Surveyor</i>	(Address, Rua do Jardim do Tabaco 33, 22°)	Westwood, J.
			John F. Light, <i>Secretary and Principal Surveyor.</i>
*LIVERPOOL	(Office, 12, Oriel Chambers)	Champness, Edward C.
			Lawrence, John
			Moverly, William
			Rutherford, John
			Wheeler, C. Edward
	<i>Engineer Surveyors</i>		McGregor, Peter
	<i>Ship and Engineer Surveyor</i>		Milner, G. A.
LUSSINO (See TRIESTE).			Hamilton, Andrew K.
LYNN		
MALAGA	<i>Ship and Engineer Surveyor</i>		Lappe, Enrique
MALTA	<i>Ship and Engineer Surveyor</i>		Wright, C. H.
MANILA	<i>Ship and Engineer Surveyor</i>		Sawyer, Frederick H.
MARSEILLES	<i>Ship and Engineer Surveyor</i> (Address, Rue Suffren 5)		Westerman, Francis
MAURITIUS (residing at Port Louis)		Cowin, John
MELBOURNE, VICTORIA		Watson, William
MEMEL		
MESSINA		
MILFORD HAVEN (Address, 15, Neyland Terrace, Neyland)		Harris, W.
MONTÉ VIDEO		Crocker, F.
MONTREAL (Address, Port Warden's Office)		Shaw, J. G.
MOULMEIN	<i>Ship and Engineer Surveyor</i>		Campbell, P.
NAGASAKI (residing at Kobé, Hiogo)		Ellerton, James
NANTES (Address, Rue de l'Héronnière 8)		Guibert, Auguste L.
	<i>Assistant Ship and Engineer Surveyor</i>		L'heureux, J.
	(Address, 20, Quai de l'Île Gloriette)		Davidson, A.
NAPIER, N.Z.		
NAPLES		
NELSON, N.Z.		
NEW ORLEANS		Turley, J. K.
NEW PLYMOUTH, N.Z.		
*NEW YORK	<i>Principal Surveyor for the United States</i>	(Office, Kemble Buildings, Whitehall Street)	Congdon, Thomas
			Henry J. Boolds, <i>Principal Surveyor.</i>
			Cooke, Thomas H.
			McNeil, James
			Scullard, J. W.
			Sharpe, W. L.
			Shilston, Thomas
			Sibun, James
			Skentelbery, C.
*NEWCASTLE-ON-TYNE	(Office, 3, St. Nicholas Buildings)	

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued*.

	<i>Engineer Surveyors</i>	...	...	...	...	...	...	{ Hirst, Richard Walliker, J. F.
	<i>Ship and Engineer Surveyors</i>	...	...	...	...	...	...	{ Barclay, J. Bourne, J. Johnstone Hake, G. A. Napier, R. J.
NEWCASTLE, N.S.W.	...	...	...	...	...	...	...	Brooks, Thomas
	<i>Engineer Surveyor</i>	...	...	...	...	...	...	Rorison, James
*NEWPORT, MON.	<i>Ship and Engineer Surveyor</i>	(Office, 30, Dock Street)						Kendall, George
ODESSA	...	...	...	...	...	...	...
OPORTO	...	...	...	(Office, Rua do Roboieira, 13, 2°)				Dos Santos, J. M.
	<i>Engineer Surveyor</i>	...	...	...	...	...	...	Ennor, C. J.
ORKNEYS	...	...	...	...	...	...	...	Baillie Geo. Gunn
PALERMO	...	...	...	...	...	...	...
PHILADELPHIA	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	{ Haug, John
		(Office, 206, Walnut Place)						Graham, D.
PIRÆUS	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	Taylor, J. E.
*PLYMOUTH	<i>Ship and Engineer Surveyor</i>	(Office, 14, Exchange)						Airth, Alexander
PORT NATAL	...	...	...	...	...	...	...
PORTLAND, MAINE	...	...	...	...	...	...	...	Pope, George
PORTLAND, OREGON	...	...	...	...	...	...	...	John, William
*PORTMADOC	...	...	...	...	...	...	...
PRINCE EDWARD	{	...	...	...	...	...	...	Welsh, H. P.
ISLAND		...	...	...	(residing at Charlotte Town)			
QUEBEC	...	...	...	...	...	...	...	Dick, John
*QUEENSTOWN	...	...	...	...	...	...	...	Tyrer, G.
RAMSGATE	...	...	...	...	...	...	...	Jones, Edward
RANGOON	...	...	...	...	...	...	...	Winter, R. R.
RIGA	...	...	...	...	...	...	...	Lindemann, C. A.
	<i>Engineer Surveyor</i>	...	...	...	...	...	...	{ Hillbring, F. W.
		(Address, Pychau Dampfsagemühle)						
RIO DE JANEIRO	...	...	...	...	...	...	...
ROCHEFORT	...	...	...	...	...	...	...
ROSTOCK	(See HAMBURG).							
ROTTERDAM	...	...	...	...	(Address, Westerhaven 6)			Loos, Jan C. W.
	<i>Ship and Engineer Surveyor for the Ports in Holland</i>							*Ollefen, W. F. D. van
ST. JOHN, N.B.	...	...	...	...	...	...	...	Coker, Charles, R.
ST. MALO	<i>Ship and Engineer Surveyor</i>	(Address, 6, Rue d'Asfeld)						Gallais, Jean
ST. PETERSBURG	<i>Ship and Engineer Surveyor</i>	...	...	...	...	...	...	{ Wessblad, A.
		(Address, Officerskaia, No. 57)						

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued*.

SALONICA	...	...	...	...	...	...	...
SAMARANG	...	...	...	...	...	...	...	Vogel, W
SAN FRANCISCO	...	...	...	...	(Office, 219, Sansome Street)			Freeman, J. H.
SEBASTOPOL	<i>Ship and Engineer Surveyor</i>							Corry, John E.	
SHANGHAI	...	...	...	...	...	...	...	Warburg, C. G.
	<i>Engineer Surveyor</i>							Sonne, H.	
SINGAPORE	...	...	...	...	...	...	...	Fittock, Charles
	<i>Engineer Surveyor</i>							{ Park, Robert	
	(Address, Ice Works, River Valley Road)								
SLIGO	...	...	...	...	...	...	...	Pollexfen, William
SMYRNA	...	...	...	...	...	...	...
SOURABAYA	...	...	...	...	...	...	...	Vader, P.
*SOUTHAMPTON	...	...	...	...	(Office, 9, Oriental Place)			Sinnette, James L
	<i>Ship and Engineer Surveyor</i>							Stevens, John B.	
SUEZ	...	...	...	...	...	...	...	Weston, A. R.
	<i>Engineer Surveyor</i>							Campbell, J.	
*SUNDERLAND	...	...	...	...	(Office, 56, John Street)			{ Richard J. Reed, Principal Surveyor
									Bath, William
									Harrison, George
									Keen, Joseph
									Williams, Jesse
		<i>Engineer Surveyors</i>							{ Allison, William
	<i>Inspector of Forgings for the North-east Coast</i>							{ Salmon, Patrick	
								Cameron, Hugh	
*SWANSEA	...	...	Office, Adelaide Chambers, Adelaide Street)					Ashton, Thomas
	For Engineer Surveyors for Swansea district see CARDIFF								
SYDNEY, N.S.W.	...	...	...	(Office, 22, Bridge Street, Sydney)			Pockley, Robert F.	
	<i>Engineer Surveyor</i>							Pollock, R.	
SYRA	...	...	...	...	...	...	...
TAGANROG	<i>Ship and Engineer Surveyor</i>							Bell, Charles	
TORONTO	...	...	...	...	...	...	...	Harbottle, Thomas
TOWNSVILLE	...	...	...	...	...	...	...	Grainger, T. L.
TRIESTE	...	...	(Office, Via Carradori No. 1, Trieste)					Florio, Elias
	<i>Engineer Surveyor for Trieste District</i>							Schnabl, Frederick	
	<i>Assistant Surveyor at Fiume</i>							Bonetich, Ignazio	
	Ditto		at Lussino		...	...	...	Tarrabocchia, Antonio E.
	Ditto		at Venice		...	...	...	Fabro, Matteo
VALENCIA	...	...	...	...	...	...	...
VALPARAISO	<i>Ship and Engineer Surveyor</i>							(Address, Casilla, No. 4)	Ivol, C. C.

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued*.

VANCOUVER ISLAND	...	...	...	...	...	...	...	Clarke, W. R.
VEENDAM	...	...	(Address, Kerklaan H, 785, Veendam)					Hazewinkel, H. P
VENICE (See TRIESTE).								
WATERFORD	<i>Ship and Engineer Surveyor</i> ...							Horn, Andrew
WELLINGTON, N.Z.	...	...	...	...	...	...	...	Bendall, William
WEXFØRD	...	...	...	...	...	...	...	Sparrow, R. J.
*WHITEHAVEN	...	...	...	...	...	...	...	House, Thomas J.
WILMINGTON, N.C.	...	...	...	...	...	...	...	Beery, B. W.
YOKOHAMA	...	...	...	...	...	...	...	Efford, John J
	<i>Engineer Surveyor</i> ... (residing at Kobé, Hiogo)							Ellerton, James

2, WHITE LION COURT, CORNHILL, LONDON

22nd June, 1887.

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LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

Section 1. THE operations of the Societies of the two Register Books of Shipping formerly printed for the use of Merchants, Ship Owners, and Underwriters, having ceased in the year 1834, this Society was then established for the purpose of obtaining a faithful and accurate Classification of the Mercantile Shipping of the United Kingdom, and of the Foreign Vessels trading thereto, and for the government of which the following Rules and Regulations have been from time to time adopted.

Section 2. A Register Book to be printed annually for the use of Subscribers, containing the names of the Ships with other useful information, and the Character assigned, where the vessels are classed by the Society; also the names, &c., of all Ships of 100 tons and upwards registered in the United Kingdom, although unclassed by this Society, and of Ships of large tonnage owned abroad.

Section 3. Each person subscribing the sum of Three Guineas per annum (or such other sum as the General Committee may fix) to be considered a Member of the Society, and entitled *for his own use* to one copy of the Register Book.

Section 4. The subscription of Public Companies, or Public Establishments (not being engaged in Marine Insurance), to be Ten Guineas per Annum.

Section 5. The subscription of Marine Insurance Companies to be regulated by the Committee on special application, in each case, but not to be less than Ten Guineas per Annum.

Section 6. The Register Books supplied to Subscribers in London will be (unless otherwise arranged) periodically posted by type, with additions and corrections throughout the year. But in the case of the Books supplied on a Subscription of £3 3s. per annum, thus posted, a charge of One Guinea per annum will be made in addition, for posting, making the Subscription £4 4s. per annum.

Section 7. For the convenience of Subscribers not resident in London, or whose Register Books are not posted, a Supplement, containing the additions to, and corrections made in, the Register Book, to be printed, fortnightly, in such convenient form, as to admit of its transmission by Post, so that such parties may be furnished, from time to time, with the latest and most complete information.

Section 8. 1. The superintendence of the affairs of the Society to be under the direction of a Committee of Merchants, Shipowners, and Underwriters: twenty-four elected in London and twenty-four at the principal Outports, and in addition, the Chairman, or, in his absence, the Deputy-Chairman of the Corporation of Lloyd's, and the Chairman, or, in his absence, the Deputy-Chairman of the General Shipowners' Society, for the time being, to be, *ex-officio*, Members of the Committee, but any member (except an *ex-officio* member) who fails to attend any meetings of the Committee for a period of six continuous months, without leave of absence, shall cease to be a member, and his place shall be filled up in the usual way.

NOTE.—Official intimation to be given in June of each year whether the Chairman or Deputy-Chairman of the Corporation of Lloyd's, or the General Shipowners' Society, respectively, are to be the ex-officio members for the ensuing twelve months.

2. The General Committee reserve the right of varying or withdrawing the representation of Outports, as well as the mode of election of Members.

Section 9. Six of the Members elected in London, namely, two of each of the constituent parts of the Committee, to go out annually by rotation, but to be eligible to be re-elected. The vacancies so arising to be filled up by the election of two Underwriters and one Merchant by the Committee of Lloyd's, and two Shipowners and one Merchant by the Committee of the General Shipowners' Society.

Section 10. Of the Members elected at the Outports twenty are to retire at the end of every *four* years, and four of the Members elected at Liverpool are to retire annually. The retiring Members are eligible for re-election.

Section 11. The Committee to appoint from their own body, annually, a Chairman and Deputy-Chairman, and also a Chairman for a Sub-Committee of Classification.

Section 12. The Committee to appoint a Sub-Committee of Classification, to be so regulated that each Member of the General Committee may, in rotation, take his turn of duty therein throughout the year

Section 13. The Secretary, Clerks, and Servants of the Society, and the Surveyors, to be appointed by and be under the direction of the General Committee.

Section 14. Special meetings to be convened by order of the Chairman, or Deputy-Chairman, or on the requisition of any three Members.

Section 15. All elections and appointments to be made by ballot, excepting when in the election of Chairman, Deputy-Chairman, or Chairman of Classification, only one person is nominated for each office.

Section 16. No Member of the Committee to be permitted to be present on the decision of the classification of any ship of which he is the owner, or wherein he is directly or indirectly interested.

Section 17. 1. The Committee to be empowered to make such By-laws for their own government and proceedings as they may deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established; but no new Rule or By-law to be introduced, or any Rule or By-law altered, without special notice being given for that purpose at the Meeting of the Committee next preceding that at which such Motion is intended to be made; such notice to be inserted in the summons convening the meeting.

2. No new Rule, or alteration in any existing Rule, materially affecting the classification of ships, to take effect until the expiration of six months from the time it shall have been determined upon.

Section 18. All Reports of survey to be made in writing by the Surveyors according to the form prescribed, and submitted for the consideration of the General Committee, or of the Sub-Committees of Classification; but the Character assigned by the latter to be subject to confirmation by the General Committee.

Section 19. 1. The reports of the Surveyors, and all documents and proceedings relating to the classification of ships are to be carefully preserved and to be open to the inspection of the Owners, but no other person or persons are to have access to such documents except with the written consent of the Owners and under the direction of the Chairman or Deputy-Chairman.

2. Copies of the original reports (if the ships be already classed, but not otherwise), so far as relates to the dimensions, scantlings, fastenings, and materials, in cases where the correctness of the reports in these particulars is certified by the builders, are granted on application.

Section 20. Foreign ships, and ships built in the British possessions abroad where there is not a Surveyor (*see also* Section 52 of the Rules for Wood Vessels), to be surveyed on their arrival at a port to which a Surveyor has been appointed; but a due regard is to be had to the circumstance of such vessels having been exempted from supervision while building, and the Character to be assigned to them is to be regulated according to their intrinsic quality and from the best information the Committee can obtain.

Section 21. In every case in which the Character assigned to a ship may be proposed, on survey, to be reduced, notice is to be given in writing to the Owner, Master, or Agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, on the Owner, Master, or Agent agreeing to pay the expenses attending the same, provided on the said survey there shall appear sufficient ground for the proposed reduction.

Section 22. 1. When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the Owner, Master, or Agent, and if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

2. All repairs of Ships or Machinery required at Ports where there is a Surveyor to this Society, in order to their obtaining a Character in the Register Book, or to their retaining the Characters assigned to them therein, must be carried out under the inspection, and to the satisfaction of the Society's Surveyors. Ships or machinery repaired at Ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

Section 23. Parties considering the repairs suggested by the Surveyor to be unnecessary or unreasonable may appeal to the Committee, who will direct a special survey to be held; but should the opinion of the Surveyor be confirmed by the Committee, then the expense of such special survey is to be paid by the party appealing.

Section 24. The Surveyors to the Society not to be permitted (without the especial sanction of the Committee) to receive any fee, gratuity, or reward whatsoever for their own use or benefit, for any service performed by them in their capacity of Surveyors to this Society, on pain of immediate dismissal.

Section 25. The Surveyors will be directed to attend on Special Surveys of ships or machinery while building or under damage or repair, when required by Merchants, Shipowners, or Underwriters; the charge for which is to be regulated according to the nature and extent of the service performed. In all cases, the application for the assistance of the Surveyors must be made in writing addressed to the Secretary.

FUNDS.

Section 26. The Funds to be under the authority and control of the Committee, and a statement of the Receipts and Expenditure to be annually printed for the information of the subscribers.

Section 27. The following Fees to be charged to the Owners of ships prior to their vessels being classed and registered in the book :—

I.

CLASSING FEES.

For First Entry of Class in the Register Book, or for Recording Continuation or Restoration, or A in Red, or for Special Survey No. 3 of Iron Ships.

For each Ship under 200 tons	...	...	...	...	£1 0 0
Ditto of 200 and under 500 Tons	...	...	...	...	2 0 0
Ditto of 500 „ 1,000 „	...	...	...	...	3 0 0
Ditto of 1,000 „ 2,000 „	...	...	...	...	4 0 0
Ditto of 2,000 and upwards	...	...	...	...	5 0 0

For First Entry of the Notification "L.M.C." in the Register Book.

For each Ship under 100 registered HP.	...	...	...	...	£1 0 0
Ditto of 100 and under 300 HP.	...	...	...	...	2 0 0
Ditto of 300 and above	...	...	...	...	3 0 0

II.

OFFICE OR REGISTRATION FEES.

Chargeable on Vessels surveyed, for other than First Entry, &c., under the above Scale I., by the Society's Non-Exclusive Surveyors.

For each Ship under 500 Tons	...	...	...	...	£0 10 0
Ditto of 500 and under 1,000 Tons	...	...	...	...	1 0 0
Ditto of 1,000 „ 2,000 „	...	...	...	...	1 10 0
Ditto of 2,000 and upwards	...	...	...	...	2 0 0

SPECIAL SURVEYS.

Section 28. 1. For ships built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✕), 1s. per ton for the first 1,000 tons, and 6d. per ton for every ton beyond 1,000 tons.

2. For machinery or new boilers built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✕ in red).

3. For engines and boilers up to 200 registered horse-power, 3 shillings per horse-power. For engines

over 200 horse-power, 3 shillings for the first 200 horse-power, and 1 shilling per horse-power above 200. No fee to be less than £8 Os. 0d.

4. For the survey and testing of Donkey Boilers, a fee of two guineas to be charged.

5. For Surveys for damage, or for other Surveys, held at the request of the Owners, and for the Survey of Ships for Restoration, Continuation, or the character A in Red, or otherwise under the Society's rules, a charge (in addition to the Fee for entry) will be made, according to the nature and extent of the service performed.

6. In cases where the caulking of ships is superintended and tested by the Surveyors, a special charge will be made, according to the tonnage of the ship.

7. All repairs which may be required on the Surveys above referred to, must be performed under the superintendence of the Society's Surveyors. (See also Section 22.)

MEM.—It is to be understood that in all cases where travelling expenses are incurred by the Surveyors in connection with the above services, they are to be defrayed by the parties interested in the same.

Section 29. Certificates of Character, on the Form No. 7, or of "L.M.C.," or "B.&M.S.," on Forms Nos. 10 or 11, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committee of Classification, and countersigned by the Secretary, will be granted on application, the charge for which will be as follows:—

For Characters of Ships under 200 Tons	...	...	...	...	£0 2 6 each
Ditto	of 200 „ and above	...	...	...	0 5 0 „
For L.M.C. or B.&M.S. of vessels under 150 HP.	...	...	...	...	0 2 6 „
Ditto	Ditto of 150 HP. and above	...	...	...	0 5 0 „
Copies of original reports, as per Section 19	...	...	...	...	1 1 0 „

FREEBOARD.

Section 30. Fees for the Survey for and assignment of Freeboard to vessels:—

For Classed Vessels under 300 tons gross	...	...	...	...	£1 1 0
Ditto ditto	of 300 tons and under 1000 tons gross	...	...	...	2 2 0
Ditto ditto	1000 „ „ 2000 „	...	...	...	3 3 0
Ditto ditto	2000 „ „ 3000 „	...	...	...	4 4 0
Ditto ditto	3000 „ „ 4000 „	...	...	...	5 5 0
Ditto ditto	4000 and above „	...	...	...	6 6 0

For vessels not classed in the Society's Register Book the charge for surveying and assigning Freeboards is dependent on the labour and time involved, but it is not in any case less than double the charges in the foregoing scale.

Section 31. Rules, complete, 10s. each copy. If for Wood Ships and Composite Ships alone, 5s. If for Iron Ships alone, 5s.

RULES FOR THE BUILDING AND CLASSIFICATION OF IRON SHIPS.

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
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RULES

FOR

THE BUILDING AND CLASSIFICATION OF IRON SHIPS.

IRON and Steel vessels will be classed **A** with a Numeral prefixed, so long as, on careful annual and periodical Special Surveys, they are found to be in a fit and efficient condition to carry dry and perishable cargoes to and from all parts of the world. (See N.B. at foot.)

100A, **90A**, and **80A**, will denote vessels that have been built in accordance with, or equal to, the Rules, and Tables G 1 to G 6, when the vessels are built of iron. In the case of vessels built of steel a general maximum reduction of 20 per cent. in the thickness of the plating, frames, &c., prescribed in Tables G 1 to G 4 for iron ships of the **90A** grade or above is allowed. Deviations from the Rules will be allowed, provided that a sketch of the midship section, plans, &c., in each case, showing the proposed scantlings and arrangements, be *first* submitted through the resident Surveyors, and approved by the Committee; and, that the vessels be built in accordance with the approved plans, under the Survey of the Surveyors of this Society.*

Vessels which do not fulfil all the requirements for the **100A** class, but which are superior to those built on the **90A** scale, may, if the Committee approve, be classed **95A**; those not equal to the **90A**, but superior to the **80A**, may be classed **85A**; and those which in some respects are deficient of the requirements of the **80A** scale, but fit for the **A** class, may be classed **75A**.

At the time of any survey, the comparative numeral will depend on the thickness of the plating and angle iron, and the general condition of the vessel.†

Vessels which are built for special purposes, and which are considered fit for such purposes, although not eligible to be classed for the conveyance of dry and perishable cargoes to and from all parts of the world, may be classed **A**, provided all the details of the scantlings and arrangements be submitted to the Committee for approval.

To the class **A** in such cases will be affixed a designation, showing the particular trade or purpose for which the vessels are intended, thus:—**A** "For River purposes only." **A** "For Tug purposes." **A** "Fishing Smack." **A** "For Channel purposes."

In the latter vessels, the particular Channel purposes intended are to be defined thus: "Bristol Channel," "Irish Channel," "English Channel," "Newhaven—Dieppe," &c.; and all vessels classed for Channel purposes must have a minimum freeboard, as required in awning-decked vessels, to be submitted for the approval of the Committee.

*N.B.—It is to be distinctly understood that the numerals prefixed to the letter **A** do not signify terms of years, but are intended for the purpose of comparison only; the **A** character assigned being for an indefinite period, subject to annual and periodical Surveys as follows.*

* In vessels building, or to be built, under contract for classification, deviations from the Rules will not be allowed by the Committee, unless the Builder shall previously obtain the sanction of the Owner.

† *Expunging or withdrawal of character.*—The twelfth, thirteenth, and fourteenth Columns, left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots . . . in Column 13 indicate that the vessel was at one time Classed by this Society, but that the Class has been withdrawn at Owner's request. A black line with date under it in Column 14 indicates that, at that date, the Vessel, from reported defects, was not entitled to a Character in the Register Book. A red line with date under it in this Column indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.

To entitle IRON AND STEEL VESSELS to retain the Characters assigned to them in the Register Book, they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3, respectively.

The periods at which these surveys are intended to be held, in the case of vessels classed from 100A to 90A inclusive, are when a vessel is 4 years, 8 years, and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching: but when the first entry survey is not completed within that period then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 survey.

Similarly, vessels classed 85A and under must be subjected to a special survey every three years, as per Nos. 1, 2, and 3, and afterwards as per Nos. 1, 2, and 3, consecutively.

In any case in which it may suit the convenience of the Owners, the special surveys Nos. 1 and 2 may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due, before leaving the United Kingdom, the word "*Expired*" will be inserted against her character in the Register Book; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

Vessels which have undergone either of the foregoing examinations, will be noted in the Register Book, thus:—*s.s.No. 1—85, s.s.No. 2—85, s.s.No. 3—85*, indicating the special survey and date thereof.

At each of these Special Surveys of vessels propelled by steam, the machinery and boilers are to be examined by the Engineer-Surveyors, and reported upon to the Committee as to their safety and efficiency.

Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them may, at the request of the Owners, be surveyed in anticipation of the Rules; and whenever the bottom plating is to be cemented a survey is to be held prior to the cement being laid.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

N.B.—In order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage or from other causes, rests with the Owners, Masters, or Agents.

***Survey No. 1.**

The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways, the limber boards and ceiling equal to one strake fore and aft on each side removed,† and both surfaces of outside plating exposed.‡

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom and the tanks tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted, their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

Upper decks must be renewed when reduced in thickness as follows, viz.:—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

Note.—*At the Special Survey No. 1 succeeding No. 3, the chain cables are to be ranged for inspection, and the coal bunkers cleared for examination.*

In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors.

For periodical Surveys of Engines and Boilers, see page 74.

***Survey No. 2.**

The vessel is to be placed on blocks of sufficient height, in a dry dock, or on ways; the limber boards and ceiling equal to three strakes fore and aft on each side removed,† and both surfaces of outside plating exposed.‡

The windlass at this and all subsequent alternate special surveys to be unhung, where necessary, and its wood linings sufficiently stripped, for examination. The chain cables are also to be ranged for inspection at this and all subsequent special surveys.

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom, and the tanks be tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted, their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2, when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

In addition to other parts required to be examined, the coal bunkers of steam vessels must be cleared for examination.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested, by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

Upper decks must be renewed when reduced in thickness as follows, viz. :—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. (See page 74.)

***Survey No. 3.**—To be held by two Surveyors, one to be an officer of the Society.—The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways; proper stages to be made and the hold to be cleared; all the close ceiling in the hold to be removed,† so that the rivets, plates of keel, and flat of bottom may be thoroughly examined; coal-bunkers of steam-vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulk-heads, rivets and inner surface of the plating to be exposed, and where side lights are fitted, the condition of the plating in way of the same to be ascertained. All oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; the planksheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors, if they deem necessary, are to ascertain the thickness of the plating by having holes drilled.‡

Such parts as may be found defective, or materially less than the required substance by Rule, are to be removed and replaced with proper materials, equal in substance and quality to the original construction.§ The planksheers, waterways, flat of decks and their fastenings, are also to be examined and made good where necessary.

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom and the tanks tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted, their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

Upper decks must be renewed when reduced in thickness as follows, viz. :—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

In addition to other parts required to be examined, the coal bunkers of steam vessels must be cleared for examination.

The chain cables are to be ranged for inspection.

In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. (See page 74.)

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation may be required.

‡ In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested, by beating or chipping, and found sound, and adhering satisfactorily to the iron, its removal may be dispensed with.

§ Where the deterioration in thickness is widespread, and it is not deemed advisable by the owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

SURVEYS WHILE BUILDING.

SPECIAL SURVEY.

The Surveyors are to examine during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

ORDINARY SURVEY.

- 1st. On the several parts of the frame, when in place complete, and before any plating is wrought.
- 2nd. On the plating, during the progress of riveting.
- 3rd. When the beams are in and fastened, before the decks are laid.
- 4th. When the vessel is complete, but before the plating is finally coated or cemented.
- 5th and last. After the vessel is launched and equipped.

SURVEY OF MACHINERY.

In vessels propelled by steam the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam. Machinery certificates will be granted, and notifications thereof made in the Register Book, thus: "LMC. 3,88" *in red* (i.e. LLOYD'S MACHINERY CERTIFICATE, March, 1888).

In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✕ will be noted in red, thus: "✕L.MC.," or "✕N.E.&B.," or "✕N.B."

For the requirements relating to the survey and construction of engines and boilers, see page 66.

RULES FOR THE BUILDING OF IRON VESSELS.

Section 1. 1. The scantlings given in Tables G 1, G 2, and G 3, are intended for vessels the length of which does not exceed *eleven times* their depth, *from the top of keel*. Where this proportion is exceeded, *see* Sec. 46.

2. For proportions of breadth to length, *see* Table G 4.

3. The measurements for regulating the proportions are to be taken as follows:—

LENGTH.

4. The length to be measured from the after part of the stem to the fore part of the sternpost, on the range of the upper deck beams, in one, two, and three-decked and spar-decked vessels, but on the range of main deck beams in awning-decked vessels.

5. In vessels where the stem forms a cutwater, the length is to be measured from the place where the upper deck beam line would intersect the after edge of stem if it were produced in the same direction as the part below the cutwater.

BREADTH.

6. The breadth is in all cases to be the greatest moulded breadth of the vessel.

DEPTH.

7. The depth in one and two-decked vessels is to be taken from the upper part of the keel to the top of the upper deck beam amidships. In spar-decked vessels and awning-decked vessels, the depth is to be taken from the upper part of the keel to the top of the main deck beam amidships. For three-decked vessels *see* Section 41.

SCANTLINGS.

Section 2. 1. The scantlings of the frames, reversed frames, and floor-plates, the thickness of bulk heads and the diameter of pillars in Table G 1, are regulated by numbers, which are produced as follows:

2. *For one and two decked vessels.*—The number is the sum of the measurements in feet, arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the upper deck beams, and the girth of the half midship frame section of the vessel, measured from the centre line at top of keel to the upper deck stringer plate.

3. *For three-decked steam vessels.*—The number is produced by the deduction of seven feet from the sum of the measurements taken to the top of the upper deck beams. (*See* Section 41.)

4. *For spar-decked vessels and awning-decked steam vessels.*—The number is the sum of the measurements in feet, taken to the top of the main deck beam, as described for vessels having one or two decks.

5. The scantlings of the keel, stem, sternposts, keelson and stringer plates, the thickness of the outside plating and deck; also the scantlings of the angle irons on beam stringer plates, and keelson and stringer angle irons in hold, as in Tables G 1, G 2, and G 4, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

QUALITY OF IRON.

Section 3. 1. The whole of the iron to be of a good malleable quality, capable of withstanding a tensile strain of 20 tons per square inch with, and 18 tons across, the grain, and to be subjected to tests at the discretion of the Surveyors. Brittle or inferior material to be rejected.

2. All plate, beam, and angle iron to be legibly stamped in two places with the manufacturer's name or trade mark, and the place where made, which is also to be stated in the report of survey.

WORKMANSHIP.

Section 4. The workmanship to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting: it is not intended to prevent the coating of the plates *inside* in the way of the frames.

KEEL, STEM, STERN, AND PROPELLER POSTS, AND TRANSOMS.

Section 5. 1. The keel, stem, stern, and propeller posts are to be either scarphed or welded together, and to be in size according to Table G 1; if scarphed, the length of scarphs to be nine times the

thickness given in the table for keels; and the rivet holes required in the *thin* ends of them are recommended to be drilled after the scarphs are fitted.

2. Where the garboard strakes are thicker than required by the Rules, the thickness of the keel may be proportionately reduced.

3. Where the keel and keelsons are made of several thicknesses of plates, the plates that form the keel to be in thickness, taken together, the same as is required for a solid keel, as per Table G 1; and the butts of the several plates of which the keel is formed to be carefully shifted from each other.

4. When **Hollow or flat keel plates** are adopted, their breadth must be the same as given for the garboard strakes, and their thickness not less than once and a third that prescribed for those strakes, for three-fifths the vessel's length amidships. The plates before and abaft this length may be gradually reduced to the thickness of the garboard strakes amidships; and the strake of plating on each side adjoining the flat keel plates to be of the thickness required for the garboard strakes in Table G 1.

5. Where flat plate keels are used, intercostal keelson plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angle irons of the dimensions given for keelson angle irons in Table G 2, riveted all fore and aft to the keel and keelson. (*See also Section 9, paragraph 6.*)

6. The butt-straps of flat keel plates are to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted.

7. The stem at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph; it may be gradually reduced from the height of the load-line to its head, where it may be three-fourths of the sectional area given in Table G 1.

8. The stern and propeller posts, and after end of keel, for single screw propelled vessels, to be of the size given in Table G 1, for stern frames, or of equal sectional area; the portion adjoining the keel to be tapered fair into it. In a sailing vessel, or paddle steamer, the sternpost may be reduced from the lower part of the rudder trunk to its head, where it may be three-fourths of the sectional area given in the Table; and, in a steam vessel having a propeller frame, it may be reduced at the head to the size given for stems in Table G 1.

9. The portion of the forging of the stern frame, forming part of the keel, is to extend sufficiently forward for the after end of its scarph in *sailing vessels and paddle steamers* to be at least once and a half the frame space before the sternpost, and in *screw propelled vessels* at least twice and a half the frame space before the propeller post.

10. The sternpost is to be extended well above the counter, and securely attached at its head to an iron deck or plate, and to a transom plate which should not be less in depth than once and a half the depth of the midship floor-plate, and of the same thickness. And in screw steamers whose plating number is 20,000 and above, the foremost or propeller post should extend sufficiently above the arch of the propeller frame to be efficiently connected to iron plating on the beams, and to a deep transom plate. (*See Section 7, paragraph 7.*)

11. The rudder braces are to be forged on the sternpost, and spaced from 4 ft. to 5 ft. 6 in.

FRAMES.

Section 6. 1. The frames to be of the dimensions set forth in Table G 1; to be in as great lengths as possible, fitted close on to the upper edge of the keel; and at the extreme ends of the vessel

the lower parts of the frames opposite to each other are to be lapped and riveted together; and in all vessels to extend to the gunwale. Where either raised quarter-decks, poops, or forecastles, are constructed, the frames are to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale; they may then terminate at the lower part of the curve.

2. When the frames are butted on the keel they are to have not less than three feet lengths of corresponding angle iron, fitted back to back, to cover and support the butts and receive the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle iron are to be fitted, if the frames are butted elsewhere.

3. The rivet holes to be punched through from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape; the holes in the way of the lands of the plating are to be drilled after the plating is wrought.

4. The spacing of the frames from centre to centre to range from twenty to twenty-six inches, according to the size of the vessel, which spacing should not be exceeded around the stern of the vessel at the knuckle. (See Table G 1.)

FLOOR-PLATES.

Section 7. 1. The floor-plates to be in size at the middle line according to Table G 1, for half the length amidships, excepting under the engines and boilers in steam vessels, where they must be one-sixteenth of an inch thicker, when the thickness prescribed in Table G 1 is nine-sixteenths of an inch or under.* They are to be moulded not less than one-half their midship depth† at a distance of three-quarters the half breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height of twice the midship depth of the floor above the top of keel. The ends of the floors to maintain the height prescribed, for one quarter of the vessel's length amidships, they may then be *gradually* lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to the ends they are to be gradually increased in depth, so as to efficiently connect the sides; the upper parts of the floors forward and aft are to be high enough to give ample room between the reversed frames, on each side of the vessel, for fitting the keelson angle irons. (See also Section 26, Paragraph 2.)

2. The thickness of the floor-plates for half the vessel's length amidships to be as given in Table; but for one quarter of her length at each end they may be reduced in thickness one-sixteenth of an inch when the plates amidships are six-sixteenths and above; and when the plates amidships are nine-sixteenths in thickness, and above, they may be reduced one-sixteenth of an inch for an eighth of the vessel's length before and abaft the half-length amidships, and the remainder may be two-sixteenths of an inch less in thickness than the midship floors.

3. A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line,

* Where a double bottom extends through the engine and boiler space, the floors need not be increased in thickness provided the top plating of the double bottom be increased one-sixteenth of an inch in thickness.

† In vessels of unusual form, in which it may be considered desirable to depart from this condition, the approval of the Committee must be obtained thereto.

except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames.

4. When floors are made in two lengths, the butts are to be well fitted, and to have double butt-straps treble riveted ; or, the floor-plates may be lapped and treble riveted.

5. Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle irons.

6. WATERCOURSES are to be formed above the frames through all the floor-plates, on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

7. TRANSOM-PLATES are to be fitted and connected to the frames, and to the sternpost so as to efficiently support the counter. (See Section 5, paragraph 10.)

REVERSED ANGLE IRONS ON FRAMES.

Section 8. 1. Reversed angle irons on frames to be in size as per Table G 1.

2. Vessels where the number for regulating the size of the frame is below 45, to have reversed angle irons riveted to every frame and floor-plate, extending across the middle line to the upper part of the bilges.

3. Vessels where the number, as per Rule, is 45 and below 57, to have reversed angle irons riveted to every alternate frame and floor-plate, extending across the middle line to the upper part of the double angle iron stringer above bilges, and on the remaining floor-plates and frames to the gunwale ; or, if the vessel is of a depth to require hold beams, the reversed angle irons are to extend to the upper part of the hold beam stringer angle iron and gunwale alternately.

4. All vessels, except those having an awning-deck, where the number, as per Rule, is 57 and upwards, to have reversed angle iron on every frame, extending alternately to the upper deck stringer plate, and top of angle iron on stringer plate next below it. In awning-decked vessels they are all to extend to the upper part of the main deck stringer angle iron.

5. In *sailing vessels* where the number, as per Rule, is 75 and upwards, the reversed frames are to extend to the gunwale on every frame.

6. Double reversed angle irons to be fitted on every floor, extending from bilge to bilge, in the engine and boiler spaces of steam vessels ; and, where the vessel is of 15 feet depth or above from the hold beams, or where the number for plating is 15,000 or above, they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them. Short double reversed angle irons are also to be fitted on all frames in way of the keelsons and stringers in hold.

7. The butts of reversed angle irons, excepting those at middle line, to be secured with butt straps, having not less than two rivets on each side of the butt.

8. The rivets for securing the reversed angle iron to the frames and floor-plates to be in diameter in proportion to the greatest thickness of angle, or plate iron, through which they pass, as specified in Table G 1, and to be spaced eight times their diameter, from centre to centre.

9. In vessels where the plating number is 20,000 and above, reversed angle irons should be fitted to every frame to the height of the upper, spar, or awning deck abaft the after peak bulkhead ; and in addition

where such vessels have broad flat counters, a double angle iron stringer should be fitted midway between the middle, and upper, spar, or awning deck beams for a reasonable length, connected by plate knees to the transom plate ; or other additional strengthening applied, as the Surveyors may deem necessary.

MIDDLE LINE KEELSONS.

MIDDLE LINE SINGLE PLATE KEELSON.

Section 9. 1. The middle line keelson, if of single plate, and standing above the floor-plates, to be of the size prescribed in Table G 2, and to have angle irons, of the dimensions given in the same Table, fitted and riveted on its upper and lower edges. In addition there is to be a rider plate, on the top of the keelson plate, extending over *three-fourths* of the length of the vessel amidships, riveted to the angle irons, the breadth of which is to be equal to the sum of the two broad flanges of the keelson angle irons together with the thickness of the centre plate it covers ; the thickness of the rider plate not to be less than prescribed in Table G 2. The butts of the plates and angle irons forming this keelson to be properly shifted, and to be efficiently butt-strapped.

2. The butts of the vertical plate to be secured with double butt-straps, each not less than two-thirds of the thickness of the plates they connect, and to be treble riveted ; the butt-straps of the rider plate to be fitted on the upper side, and to be treble riveted ; the butt-straps of the angle irons to be of sufficient length to have not less than three rivets properly arranged on each side of the butt.

3. Vessels in which the number for plating is 33,000 and above, are to have a foundation plate not less than eighteen inches broad and ten-sixteenths of an inch thick fitted on the top of the floors under the middle line plate keelson.

MIDDLE LINE BOX KEELSON.

4. If a box keelson be adopted, it is to be formed of plates, properly shifted, of the thickness given in Table G 2, with a foundation plate ; the depth to be the same as that prescribed for single plate keelsons ; the angle irons to be of the size given in Table G 2. The box is to maintain its depth for half the vessel's length amidships, it may then be gradually reduced to two-thirds of the same at the extreme ends.

MIDDLE LINE INTERCOSTAL KEELSON.

5. If a middle line intercostal keelson be adopted, the plates are to be of the thickness prescribed in Table G 2, and riveted to vertical angle irons of not less size than the reversed frames, to be fitted and attached to all floor-plates ; the intercostal plates to extend from the keel to the top of the floors, and to be fitted close to them. A bulb plate, at least two inches deeper than required for the main deck beams, is to be let down below the top of the floors, between the reversed angle irons, sufficiently for the intercostal plates to be riveted thereto, and the bulb to be fitted between, and riveted to, two longitudinal angle irons on the floors, extending all fore and aft, of the size given for keelson angle irons in Table G 2 ; or, the letting down of the bulb plate may be dispensed with, if the intercostal plates are extended to the upper edge of the longitudinal angle irons.

6. When intercostal keelsons are adopted with hanging keels, in vessels where the number for plating is 13,000, and under 18,000, instead of a bulb plate there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angle irons at top and

bottom, and a rider plate on its upper edge, of the sizes given in Table G 2; the vertical plate and the rider plate are to be of the thickness required for stringer plates in upper line of Table G 4, and the depth above the floors to be sufficient to admit of the angle irons being properly fitted. When the number is 18,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table G 2 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table.

7. Where **Flat plate keels** are used, intercostal keelson plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angle irons of the dimensions given for keelson angle irons in Table G 2, riveted all fore and aft to the keel and keelson. In vessels where the number for plating is 13,000 and under 15,000, or where the length exceeds ten times the depth, instead of a bulb plate, there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, or connected to the centre through-plate, having double continuous angle irons at top and bottom, and a rider plate on its upper edge; the vertical plate and the rider plate are to be not less in thickness than that given in the upper line of Table G 4 for stringer plates, and the depth above the floors to be sufficient to admit of the angle irons being properly fitted. Where the number is 15,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table G 2 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table. Where the number is 26,000 and above, the flat-plate keel should be doubled for one-half the vessel's length amidships.

CENTRE THROUGH-PLATE KEEL AND KEELSON.

8. If the middle line keelson be formed of a centre through-plate, extending from the lower edge of the keel to the top of the floors, it must be two-sixteenths of an inch thicker than that required in Table G 2 for intercostal keelsons. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to the double vertical angle irons riveted to their ends and to the centre plate keelson, there is to be a flat keelson plate, of the same thickness as, and not less than three-fourths the breadth of, the garboard strakes in Table G 1, riveted to double reversed angle irons on the upper edge of floors, and to two fore and aft angle irons on the upper edge of the centre through-plate keelson; and where the number for plating is 15,000, and under 18,000, there is to be a bulb plate of the size of the main deck beams, fitted between, and riveted to, two longitudinal angle irons of the size for keelson angle irons in Table G 2, connected to flat plate keelsons and double reverse bars on top of floors. But, should the centre through-plate keelson be extended above the upper edge of the floors, then it is to be connected by two fore and aft angle irons, of the size given in Table G 2, to two flat plates, one on each side of the middle line, to be one-sixteenth of an inch thicker than that given for intercostal plates, and one-third the breadth of the garboard strakes, to be well riveted to the double reversed angle irons on the upper edge of the floors. Where the number is 18,000 and above, the centre through-plate keelson is to extend sufficiently high above the floor-plates to take two pairs of double angle irons of the size given for keelson angle irons, and there is to be a rider plate fitted on the top of the thickness of the keelson plate.

9. In all cases the middle line keelson is to be extended as far forward and aft as practicable.

BILGE KEELSONS, AND STRINGERS IN HOLD.

- Section 10.** 1. All vessels to have bilge keelsons, extending all fore and aft, and placed at the lower turn of the bilges, formed of double angle irons fitted back to back, of the size given in Table G 2.
2. If the vessel has but a single tier of beams and her number in Table G 2 is under 7,200, a side stringer, formed of the same size angle irons, is to be fitted about midway between the bilges and upper deck, extending all fore and aft.
3. Where the number is 7,200 and above, and the vessel is under 14 feet depth of hold, two double angle iron stringers are to be fitted on each side between the bilge keelsons and the deck beams, the upper pair to extend three-fifths of the vessel's length amidships, and the lower pair to extend all fore and aft, to be riveted back to back and to double reversed angle irons on the frames; the size of them not to be less than those used for the middle line keelson.
4. For stringers in hold, *see also* Section 14.

SIDE KEELSONS.

Section 11. 1. In vessels where the number in Table G 2 is 13,000, and under 15,000, a double angle iron keelson is to be fitted on each side, as far forward and aft as practicable, and to be placed about midway between the middle line and bilge keelsons.

2. Where the number is 15,000, and upwards, intercostal plates are to be fitted on each side, as far forward and aft between the floors as practicable, and to be placed about midway between the middle line and bilge keelsons; these plates are to be fitted close to the floors, and to be attached to the outside plating with an angle iron of not less size than $3 \times 3 \times \frac{7}{16}$, but, if the plating number is 21,700 or above, these angle irons must not be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$; they are to extend to the top of the floors, and longitudinal plates, in long lengths of the same thickness as the intercostal plates, are to be let down and riveted to them. These plates are to be fitted between, and riveted to, two longitudinal angle irons of the size given for keelson angle irons; or the longitudinal plates may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angle irons and riveted to them.

3. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into, or scarp the double bottom not less than three spaces of frames, and to be connected to the longitudinal girders where practicable.

4. Vessels not being of a size to require side intercostal keelson plates are to have washplates, of the thickness given for bulkheads in Table G 1, fitted between the middle line and bilge keelsons, for not less than half the vessel's length amidships.

DETAILS RELATING TO KEELSONS AND STRINGERS.

Section 12. 1. Where bulb iron is used for keelsons or stringers, the joints to be overlapped and riveted, or otherwise efficiently connected; if overlapped, the length of lap must not be less than twice the depth of the bulb plate; iron of other form than bulb may be used for them, if of equal strength.

2. All angle irons for keelsons and stringers are to be in long lengths, properly shifted; and wherever butted to be connected with angle or plate iron, not less than two feet long, fitted in the throat of them,

properly riveted to each flange. The thickness of the connecting plates not to be less than the thickness of the angleirons they connect.

3. In all cases the middle line, side, and bilge keelsons, and, where practicable, the stringers, are to be carried fore and aft, continuously through the bulkheads, the latter being made watertight around them; and, where such parts of the ship are necessarily separated, the longitudinal strength is to be efficiently maintained, to the satisfaction of the Surveyors.

4. All middle line and intercostal keelson plates may be reduced in thickness forward and aft, to the same extent as allowed in the floor-plates; or the former may be proportionately reduced in depth at the ends of the vessel.

5. All keelson and stringer angle irons may be reduced one-sixteenth of an inch in thickness, when above seven-sixteenths of an inch amidships, for one-fifth the vessel's length at each end.

BEAMS.

Section 13. 1. Beams are to be of the form and size given in Table G 3; or they may be composed of any other approved form, equal in strength.

2. The beams, at the ends of hatchways on spar and upper decks exceeding in length six spaces of frames, must be equal in size to those of the main or middle deck.

3. Strong beams in the machinery space of steamers must, in all cases, have double angle irons on their upper and lower edges.

4. In sailing ships where the length of the midship hold beam exceeds 39 feet, the hold beams should be one inch more in depth than prescribed in Table G 3, unless they be additionally pillared. But where the length of Midship-hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter stanchion pillars at alternate beams, for not less than one-half the vessel's length amidships.

5. All beams to be well and efficiently connected or riveted to the frames, with bracket ends or knee-plates; each arm of knee-plates not to be less in length than twice and a half the depth of beams, and to be in thickness equal to the beams; and not more than two holes in each beam arm to be punched before the beam is in place. When the length of the midship upper deck beams in sailing vessels exceeds 36 feet, the bracket knees to each tier of beams are not to be less than three times the depth of the beam.

6. It is recommended that the round up of the beams of all weather decks should not be less than one quarter of an inch per foot of length of beam. In all cases where a freeboard is assigned by the Committee, this amount of round-up will be assumed in determining the minimum freeboard, which is required for insertion in the Register Book.

7. The beams of the various decks, or of tiers of beams, are to be placed over each other. *For variations and reductions in sizes of beams at the ends of vessels, see Table G 3, and footnotes.*

8. If the beams of the several decks in steam vessels of 43 feet and upwards in breadth be supported by a double row of pillars stepped upon the side keelsons, the depth of the main and lower deck beams may be one inch less than given in Table G 3, and the depth of the upper deck beams in three deck vessels may be half an inch less than given in the Table. (See Section 15.)

SPACING OF BEAMS, AND STRINGERS IN HOLD.

Section 14. 1. The spacing of beams, or the arrangement of stringers substituted for beams, is to be regulated by the *depth amidships*,* measured from the upper part of floor-plates of the depth given in Table G 1, to the top of the upper, spar, or awning-deck beams, excepting in awning-decked vessels of less than 15 feet depth of hold to the main deck, in which case the arrangement of stringers in hold, &c., is to be regulated by the depth of hold to the main deck. (See also Section 10, paragraphs 2 and 3.)

2. All upper deck beams and the middle deck beams of three-decked ships, and the main deck beams of spar and awning-decked ships, to be fastened to alternate frames.

3. All Vessels under 12 feet in depth are to have a double angle iron stringer extending all fore and aft, about midway between bilge keelson and deck beams, riveted back to back and to double reversed angle irons on the frames, or to single lug pieces of the size of the frames.

4. All Vessels of 12 and under 13 feet in depth to have, in addition to the foregoing, bulb iron of the size required for their deck beams, riveted between the continuous double angle iron stringer for three-fifths the vessel's length amidships; or the bulb iron may be dispensed with, provided that, in lieu thereof, intercostal plates in long lengths be fitted between the double angle iron stringer, and attached by single angle iron to the outside plating.

5. All Vessels of 13 and under 14 feet in depth to have, instead of the bulb iron, as described above, a plate not less than 12 inches wide and $\frac{7}{8}$ thick, with double angle irons fitted on the inner edge the size of the keelson angle irons, and extending all fore and aft, and supported by brackets at every third frame.

6. All Vessels of 14 feet depth and above to have a double angle iron stringer of the size given in Table G 2, extending all fore and aft at the upper turn of the bilge on each side.

7. All Vessels of 14 and under 15 feet in depth to have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with a stringer plate of the size given in Table G 4 for hold beam stringers, attached to the plating and supported by brackets at every alternate frame between the beams, and secured to the beams by efficient gusset plates.

8. All Vessels of 15 and under 16 feet in depth to have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Section 16, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate. On the inner edge of the stringer plate, between the beams, an angle iron is to be fitted, of the size given for keelson angle irons in Table G 2, with its deep flange vertical, and covering the ends of the bracket plates.

9. All Vessels of 16 and under 17 feet in depth to have hold or lower deck beams fastened to every second and fourth frame alternately, or they may have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case.

10. All Vessels of 17 and under 18 feet in depth to have hold or lower deck beams fastened to every

* In Steam vessels constructed with a cellular double bottom extending all fore and aft, the depth for regulating the spacing of beams and stringers in hold may be taken from the inner bottom, the depth of which to be taken as prescribed in Table G 6, provided bracket frames be extended in a fair curve up the bilges to the same extent above the height of the inner bottom at the middle line, as required by the Rules for floors in vessels having a single bottom, but a tier of beams is not to be dispensed with. For depth under raised decks see Section 45.

second and fourth frame alternately; or, they may have hold beams as described in the foregoing paragraph, fastened to every *tenth* frame, provided double angle irons, $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate with a face plate $\frac{7}{16}$ of an inch in thickness, and gusset plates at the beam ends

11. SAILING VESSELS of 18 and under 21 feet in depth to have hold or lower deck beams fitted to every alternate frame.

12. SAILING VESSELS of 21 and under 22 feet in depth from the upper part of the upper deck beams, or of 14 and under 15 feet from the upper part of the hold or lower deck beams to the top of the floors, to have the lower deck beams fitted to every alternate frame, and to have two double angle iron stringers extending fore and aft, between the bilge keelson and hold or lower deck beams, on each side.

13. SAILING VESSELS of 22 and under 24 feet in depth from the upper part of the upper deck beams, or 15 and under 16 feet from top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have, in addition to the above, bulb plates of the size of the hold beams fitted and riveted between each of the two side stringers in lower hold on both sides, to extend all fore and aft.

14. SAILING VESSELS of 24, and under 25 feet in depth, from the upper part of the upper deck beams, or 16 and under 17 feet in depth, from top of lower deck beams, to have, in addition to the foregoing, intercostal plates of the thickness given in Table G 2, attached to the outside plating, and fitted to the upper stringer, all fore and aft, and to the lower stringer from one quarter of the vessel's length aft, until it is incorporated with the panting stringer.

15. SAILING VESSELS of 25 and under 26 feet in depth from upper deck, or of 17 and under 18 feet in depth from top of lower deck beams, are to have the lower deck beams fitted to every alternate frame, and to have orlop stringer plates of the dimensions required for hold beam stringer plates in Table G 4 fitted and attached to the outside plating and reversed frames by angle irons of the size given in Table G 2. These stringers must be supported by bracket plates riveted to them, and to alternate frames; and upon the inner edge of the stringer plate an angle of the size of keelson angle irons, as per Table G 2, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or, if preferred, an additional side stringer to those required in the preceding paragraph may be fitted, formed of double angle irons, bulb, and intercostal plates attached to the outside plating and fitted all fore and aft.

16. SAILING VESSELS of 26 and under 27 feet in depth from the upper deck, or of 18 and under 20 feet from the top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have orlop beams of the size given on Table G 3 for "hold beams of extra strength" fitted to every *tenth* frame, or these beams may be *twelve* frame spaces apart, provided double angle irons, $4 \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

17. STEAM VESSELS of 18 and under 20 feet in depth to have hold beams fastened to every alternate frame; or hold beams of extra strength, as given in Table G 3, may be fitted to every *eighth* frame, provided an angle iron, of the size given for keelson angle irons in Table G 2, be fitted on the inner edge of the stringer plate, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; or these beams may be spaced wider, not exceeding *ten* frame spaces, provided double angle irons $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, and a face plate, $\frac{8}{16}$ of an inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates as above.

18. STEAM VESSELS of 20 and under 21 feet in depth to have, in addition to the foregoing, an extra side stringer, formed of double angle irons of the size of the keelson angle irons, fitted between the hold beams and bilge stringer, extending as far forward and aft as practicable.

19. STEAM VESSELS of 21 and under 22 feet in depth, to have, in addition to the above, a bulb plate of the size required for hold beams, fitted between the double angle irons of each of the side stringers for half the vessel's length amidships.

20. STEAM VESSELS of 22 and under 24 feet in depth from the upper part of the upper deck beams, or of 15 and under 16 feet from the upper part of the lower deck beams to the top of the floors, to have the lower deck beams fitted to every alternate frame, and to have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table G 4 for hold beam stringer plates; and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; and on the inner edge of the stringer plate, between the beams, an angle iron is to be fitted, of the size given for keelson angle irons in Table G 2, with its deep flange vertical, and covering the ends of the bracket plates.

21. STEAM VESSELS of 24 and under 25 feet in depth from the upper deck, or 16 and under 17 feet from top of the middle deck beams, to have hold beams fastened to every second and fourth frame, alternately, or they may have hold beams of extra strength, as given in Table G 3, fastened to every eighth frame; and to have an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case, or they may be spaced wider, not exceeding ten frame spaces, provided double angle irons, $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{7}{16}$ of an inch in thickness.

22. STEAM VESSELS of 25 and under 26 feet in depth from the upper deck, or 17 and under 18 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every second and fourth frame alternately; or they may have hold beams of extra strength, as given in Table G 3, fastened to every eighth frame, and to have an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case, or these beams may be ten frame spaces apart, provided double angle irons, $4 \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

23. STEAM VESSELS of 26 and under 28 feet in depth from the upper deck, or 18 feet and under 20 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame; or, if hold beams of extra strength, as given in Table G 3, be fitted, they may be fastened to every eighth frame, provided an angle iron, of the size given for keelson angle irons in Table G 2, be fitted on the inner edge of the stringer plate and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angle irons, $4 \times 4 \times \frac{8}{16}$, and a face plate $\frac{9}{16}$ in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

24. STEAM VESSELS of 28 and under 30 feet in depth from the upper deck, or 20 and under 22 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame, or if hold beams of extra strength, as given in Table G 3, be fitted, they may be fastened to every eighth frame, provided an angle iron of the size given for keelson angle irons in Table G 2, be fitted on the inner edge of the stringer plate, and gusset plates be fitted as in the previous case; or these beams

may be spaced wider, not exceeding *ten* frame spaces, provided double angle irons, $4 \times 4 \times \frac{1}{16}$, and a face plate, $\frac{1}{8}$ in thickness, be fitted on the inner edge of the stringer plate with gusset plates at the beam ends. In addition a double angle iron stringer, of the size given for keelson angle irons in Table G 2, is to be fitted midway between the bilge stringer and the hold beams.

25. STEAM VESSELS of 30 and under 33 feet in depth from the top of the upper deck beams to the top of floors, or in which the depth from the top of the lower deck beams is 15 and under 18 feet, to have the lower deck or hold beams fitted to every alternate frame, and to have below them an orlop stringer plate attached to the outside plating and reverse frames, of the thickness, and three-fourths of the breadth, of the lower deck stringer plates, supported by bracket plates riveted to them and to alternate frames; and upon the inner edge of the stringer plate an angle iron, of the size of keelson angle irons, as per Table G 2, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or a stringer of other form may be fitted, if approved by the Committee.

26. STEAM VESSELS of 33 and under 36 feet in depth from the top of the upper deck beams to the top of floors, or in which the depth from the top of the lower deck or hold beams is 18 feet or above, are to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table G 3 for "hold beams of extra strength," fitted to every *tenth* frame, with stringer plates on them, and gusset plates at their ends.

27. Plans of all vessels above 36 feet in depth must be submitted for the consideration of the Committee, with a view to additional transverse strength being provided; and in all vessels where the height between decks is 8 feet or above, at any part, additional transverse strength at such part must be submitted for approval.

28. When the beams exceed two spaces of frames apart, a knee or bracket plate is to be riveted to alternate frames and to the stringer plate.

29. Notwithstanding the foregoing arrangements for the spacing of beams, whenever a deck is laid, the beams are not to be further apart than two frame spaces.

30. Where it is necessary, in consequence of long hatchways, engine-rooms, boiler spaces, &c., to dispense with some of the hold or lower deck beams, compensation must be made by fitting hold beams of extra strength, as given in Table G 3, with gusset plates, and angle irons, &c., on the stringer plates—regulated by the depth of the vessel, in accordance with the foregoing paragraphs of this Section.

31. If an arrangement differing from the foregoing in the spacing of the hold beams, to suit convenience of stowage, be required, a sketch showing beams and stringers of extra strength, or web frames, with all particulars, must be submitted through the Resident Surveyors, who are to state their opinion thereon, for the Committee's consideration.

PILLARS.

Section 15. 1. All beams, for at least three-fourths the length of the vessel amidships, the alternate beams before and abaft this length, and all carlings of hatchways, exceeding in length six spaces of frames, to be pillared; in addition, the beams under deck houses, bowsprit, pall bitt, windlass, steam winches, and capstan are to be pillared, and wherever else the Surveyors may deem necessary; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper, spar, or awning deck, and to be of the sizes given in Table G 1. Where a vessel has three decks

or tiers of beams, the size of the pillars to the middle tier is to be a mean between the sizes given in Table G 1.

2. In sailing ships where the length of the midship hold beam exceeds 39 feet, the hold beams should be one inch more in depth than prescribed in Table G 3, unless they be additionally pillared. But where the length of Midship-hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter stanchion pillars at alternate beams, for not less than one-half the vessel's length amidships. In steam vessels of 43 feet and upwards in breadth, the beams should be supported by a double row of pillars stepped upon the side keelsons, in which case the depth of the main and lower deck beams may be one inch less than given in Table G 3, and the depth of the upper deck beams in three deck vessels may be half an inch less than given in the Table. (*See* Section 13.)

3. All pillars to have solid welded heads and heels.

4. Pillars which extend from the keelson to the upper deck beams in vessels with two decks, or hold or beams; or to the middle deck beams in vessels with three decks, or tiers of beams; and the tiers pillars in sailing ships of 22 feet depth of hold and above, are to have their diameter increased by three-eighths of an inch beyond that given in Table G 1.

5. When split pillars are fitted for the purpose of securing shifting boards, each of the separate parts of the pillar where split should be made at least half an inch larger than the half of the single pillar required by the Rules, and the parts are to be efficiently connected by bolts or otherwise to the satisfaction of the Surveyors.

6. Where hollow pillars are to be used, the diameter and thickness of the same are to be submitted for the approval of the Committee.

7. If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates, angle irons, and a transverse vertical plate, or by other efficient means to the satisfaction of the Surveyors. Great care is to be taken to insure the beams in the engine room being pillared where practicable.

STRINGERS ON BEAMS.

Section 16. 1. All vessels to have stringer plates upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three-decked vessels, and upon the main deck beams of spar and awning-decked vessels, to be of the breadth and thickness given for main stringer plates in Table G 4, for half the vessel's length amidships; from thence to the ends of the vessel they may be gradually reduced to the dimensions given for the ends of main stringer plates in Table G 4.

2. The stringer plates on ends of the beams next below the upper deck in two-decked vessels, and below the middle deck in three-decked vessels, and below the main deck in spar or awning-decked vessels, to be of the total breadth and thickness given for hold beam stringers in Table G 4.

3. The stringer plates on ends of middle deck beams of three-decked vessels, to be of the same width as that given in Table G 4, but they may be one-sixteenth of an inch less in thickness.

4. The stringer plates on the ends of spar-deck beams are to be the breadth of, and may be two-sixteenths of an inch less in thickness than, the stringer plates given on the upper line of Table G 4 for vessels of the same plating number, and may be reduced at their ends to seven-sixteenths of an inch, and to the breadth given for the ends of main deck stringer plates in Table G 4.

5. The stringer plates on the ends of awning-deck beams to be of the same width as given in Table G 4 for hold beam stringer plates, and to be six-sixteenths of an inch in thickness when the plating number is under 14,000, and seven-sixteenths of an inch in thickness when the plating number is 14,000 and under 26,000, and eight-sixteenths when the plating number is 26,000 and above.

6. The stringer plates on all tiers of beams are to be fitted home, and riveted to, the outside plating, all fore and aft, with angle irons of the dimensions required by Table G 2; the middle, lower, and orlop deck stringer plates to have an additional angle iron extending all fore and aft, riveted to the reversed frames, and to the stringer plates.

7. In cases where no deck is laid, and the width of the stringer plate on the ends of the hold beams is objected to, it may be reduced, provided such reduction be fully compensated for, and receive the sanction of the Committee.

8. The objectionable practice of cutting through the stringer plates for the admission of wood rough-tree stanchions will not be allowed. When the frames are extended through the upper deck stringer plate to form rough-tree stanchions or bridge-houses, or poops and forecastles, there must be a continuous angle iron, of the size given for upper deck stringer angle irons, wrought on the upper deck stringer plate inside the frames.

9. The main and hold beam stringer plates may be reduced at the ends of the vessel to the sizes given for the same in Table G 4. Where a reduction of two-sixteenths of an inch in thickness is allowed, the stringer plate may be reduced one-sixteenth of an inch in thickness for one-eighth of the vessel's length before and abaft the half-length amidships, and from thence to the ends they may be reduced another sixteenth of an inch in thickness.

10. A lining piece should be fitted behind the upper deck stringer angle iron in one, two, three-decked, and spar-decked vessels, from butt-strap to butt-strap of the sheerstrake when single, to admit of those butt-straps being in one length, the lining piece being the thickness of the butt-straps, and increased in depth in way of scuppers to admit of being riveted to the sheerstrake above and below the upper deck stringer plate—unless the sheerstrake extend sufficiently high above the stringer plate to admit of a butt-strap being fitted above the stringer in the throat of the angle iron, and extending high enough to take two rows of rivets vertically above the angle iron. When the sheerstrake is doubled above the stringer plate, it should be extended sufficiently high above the latter to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

11. The upper deck stringer angle iron is in all cases to be fitted on the upper side of the stringer plate, with its deep flange vertical and turned upwards.

12. When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle irons forming the ends of the gutters are to be welded, and the gutters to be carefully caulked; and it is recommended that, when completed, they be cemented.

TIE-PLATES ON BEAMS.

Section 17. 1. All vessels to have tie-plates ranging all fore and aft upon each side of the hatchways, *on each tier of beams*, these plates to be lapped or butted, and at least double riveted. Upon hold beams where no deck is to be laid, or where tie-plates would interfere with stowage of cargo, double angle irons of the dimensions given in Table G 2 for angle irons on lower deck beam stringer plates, placed

at middle line or at each side of the hatchways, extending fore and aft wherever practicable, and well riveted to all beams, deck hooks, and transoms, will be admitted in lieu thereof.

2. Diagonal tie-plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie-plates are to be fitted all fore and aft on the upper deck.

3. Where diagonal tie-plates cross each other, or the fore and aft tie-plates, between the beams, and a deck is to be laid thereon, one set of tie-plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams.

4. The tie-plates to be of the width and thickness given in Table G 4, for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other, and to the beams, deck hooks, and transoms; and all butts to be properly shifted.

HOOKS AND CRUTCHES, AND PANTING ARRANGEMENTS.

Section 18. 1. All stringers, where practicable, to extend fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches of the same thickness as the floor plates amidships, and those below the hold beams should be spaced about four feet apart. In vessels whose plating number is 24,000, or above, an additional hook or crutch should be fitted at the ends of the vessel, between each tier of beams, to the satisfaction of the Surveyors.

2. All vessels must have provision made to prevent panting, by extra beams, bracket knees, and stringer plates being fitted in the peaks, forward in sailing vessels and paddle steamers, and forward and aft in screw-propelled vessels and all vessels having a raised quarter-deck; the sizes, arrangement, and security of them to be to the satisfaction of the Surveyors.

3. In vessels having fine ends, these stringer plates are to be attached to the outside plating with an angle iron; and beams and stringer plates are to be fitted before the collision bulkhead, and also abaft, where necessary.

PLATING.*

Section 19. 1. The thickness of plating for half the vessel's length amidships, to be as given in Table G 1, and may be tapered towards the ends of the vessel as described below; but in sailing vessels where the plating number is 16,000 or above, three strakes of plating at the bilges are to be increased one-sixteenth of an inch in thickness throughout, and when the plating number is 22,000 and above, the strake of plating in way of the hold beams is to be increased one-sixteenth of an inch in thickness, for one-half the vessel's length amidships.

2. No plates to be less in length than five spaces of frames, except the fore and after hoods.

3. No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames, and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

4. The butts of the upper or main deck, and of spar-deck stringer plates, in all cases, to be shifted not less than two spaces of frames clear of the butts of the sheerstrakes.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these double plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

5. The butts of the garboard strakes to be shifted clear of the keel scarphs, and not to be nearer each other on opposite sides of the vessel than two spaces of frames.

6. All butts of plating, where practicable, to be planed and fitted close; the edges of the plating to be sheared from their faying surfaces, or the burr caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

7. The thickness of the sheerstrakes amidships to be as given in Table G 1, and their breadth to be not less than 30 inches where the number for plating is under 7,200; not less than 33 inches where the number is 7,200 and under 11,800; not less than 36 inches where the number is 11,800 and under 16,600; and not less than 40 inches where the number is 16,600 and above; except where the thickness is greater than prescribed, in which case the breadth may be diminished, provided the sectional area be not less than required by the Rules.

8. The sheerstrakes in one, two, three-decked, and spar-decked vessels, where the butt-straps do not extend to the upper edge in one length, to be fitted sufficiently high above the upper deck beam ends, so as to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

9. The garboard strakes to be of the breadth and thickness amidships given in Table G 1.

10. The garboard strakes of screw-propelled vessels, if ten-sixteenths of an inch or more in thickness amidships, may be reduced one-sixteenth of an inch before and abaft the half length of the vessel; if nine-sixteenths of an inch and not less than seven-sixteenths, they may be reduced one-sixteenth of an inch *before* the half length only.

11. The garboard strakes of sailing vessels or paddle steamers, if seven-sixteenths of an inch or more in thickness, may be reduced one-sixteenth of an inch before and abaft the half length of the vessel.

12. The outside plating, if not less than six-sixteenths of an inch in thickness amidships, may be reduced one-sixteenth of an inch for a fourth of the vessel's length at each end. But the garboard strakes and boss plates in all screw steamers, and also the after hoods of plating connected to the stern frame, where the plating number is 16,600 and above, must be retained of the thickness required for the same strakes amidships.

13. When the plates are ten and under twelve-sixteenths of an inch in thickness amidships a reduction will be allowed of one-sixteenth of an inch for an eighth of the vessel's length before and abaft the half length amidships, and the remaining plates at the ends may be two-sixteenths of an inch less in thickness than those of their respective strakes amidships. When the plates are twelve-sixteenths of an inch or more in thickness amidships, they may be reduced three-sixteenths at the extreme ends of the vessel.*

14. The boss-plates covering the screw shaft are to be the same thickness as the strakes amidships of which they form part, where the number for plating is under 14,300; if that number and under 18,700, the plates are to be one-sixteenth of an inch thicker; and if the number is 18,700 and under 26,400 the plates are to be one-sixteenth of an inch thicker than the midship plating, and the butts treble riveted; and, where the number is 26,400 and above, the boss-plates and the plates above and below the same to

* In sailing vessels the outside or overlapping strakes of plating for one quarter of the vessel's length at her fore end should only be reduced one-sixteenth of an inch from the midship thickness.

be two-sixteenths of an inch thicker than the midship plating, and their butt-straps extended from frame to frame; or the boss-plates are to be doubled.

15. When plates forming the outside strakes of plating are above 40 inches but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{16}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by Section 20 to be treble riveted, the straps should be $\frac{2}{16}$ of an inch thicker. When for special reasons broader plates than above described are required, the sanction of the Committee for their use must be obtained.

16. Where gutter waterways are adopted at the upper deck, the butt-straps of the bulwark plating are to be sufficiently broad to receive the spur in the middle of the bulwark stay; and when the plates do not exceed twelve feet in length they are to have stays fitted against the butt-straps, and an intermediate stay is to be fitted between the butts. In no case are the stays which support the bulwarks to be more than six feet apart. Their size may be from $1\frac{3}{4}$ in. to 2 in. in diameter, regulated by the length of the stay and the size of the vessel. These arrangements may be modified according to circumstances, if to the satisfaction of the Surveyors.

BUTT-STRAPS.*

Section 20. 1. In vessels where the plating number does not exceed 8,000, the butt-straps of the sheerstrake, deck stringer plates, and one strake at the bilges for half the vessel's length amidships, are to be one-sixteenth of an inch thicker than the plates they connect, and be double riveted. When the plating number is above 8,000, and not exceeding 13,000, the butt straps of the deck stringer plates, sheerstrake, and two strakes of plating round the bilges are to be one-sixteenth of an inch thicker than the plates they connect for half the vessel's length amidships and treble riveted.

2. When the plating number is above 13,000, and not exceeding 17,000, the butt-straps of deck stringer plates, sheerstrake, and three strakes of plating round the bilges are to be one-sixteenth of an inch thicker than the plates they connect for half the vessel's length amidships and treble riveted.

3. When the plating number is above 17,000, and not exceeding 24,000, the butt-straps are to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted for four strakes of plating around the bilges, instead of three, as above, for half the vessel's length amidships.

4. When the plating number is above 24,000, and not exceeding 28,000, in addition to the above the butt straps of the remaining outer alternate strakes of plating are to be one-sixteenth thicker than the plates they connect and treble riveted for half the vessel's length amidships.

5. Where the plating number is above 28,000, and not exceeding 33,000, the whole of the butt-straps are to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted for half the vessel's length amidships.

6. Where the plating number is above 33,000, and not exceeding 40,000, the whole of the butt straps of the outside plating, and the upper and middle deck stringer plates, are to be two-sixteenths of an inch thicker than the plates they connect, and treble riveted for two-thirds the vessel's length amidships.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

7. A lining piece should be fitted behind the upper deck stringer angle iron in one, two, three-decked, and spar-decked vessels, from butt-strap to butt-strap of the sheerstrake when single, to admit of those butt-straps being in one length, the lining piece being the thickness of the butt-straps, and increased in depth in way of scuppers to admit of being riveted to the sheerstrake above and below the upper deck stringer plate,—unless the sheerstrake extend sufficiently high above the stringer plate to admit of a butt-strap being fitted above the stringer in the throat of the angle iron, and extending high enough to take two rows of rivets vertically above the angle iron. When the sheerstrake is doubled above the stringer plate, it should be extended sufficiently high above the latter to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

8. All butt-straps to be of the breadth given in Table G 1, and in no case to be less in thickness than the plates they connect; the fibre of the iron to be in the direction of the fibre of the plates they connect.

LINING PIECES.

9. The space between the plating and the frames to have solid filling or lining pieces in one length, closely fitted; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in Section 22, Paragraph 5.

RIVETING AND RIVETS.* (See also Table G 5.)

Section 21. 1. The landing edges of outside plating when seven-sixteenths of an inch in thickness and above from the keel to the upper turn of bilge, *and of the sheerstrake*; and when nine-sixteenths of an inch and above from the upper turn of bilge to the gunwale, must be double riveted; below these thicknesses the edges may be single riveted. In all cases the thicker of the two plates is to regulate the size of the rivets, and the requirements as to double riveting. When the plating is of a thickness amidsips to require the edges to be double riveted, the same is to be continued all fore and aft. The stem, stern-post, keel, butts of outside plating, breasthooks, transoms, stringer and tie-plates on beams, also butts of keelsons, stringers, and all longitudinal ties, to be at least double riveted in all vessels.

2. The butts of outside plating to be chain riveted. All double and treble riveting, except in the keel, stem, and sternpost, is recommended to be chain riveting.

3. In chain-riveted butts, a space equal to twice the diameter of the rivet to be between each row; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

4. The overlaps of plating, where chain riveting is adopted, are not to be less than six times the diameter of the rivets; and, where single riveting is admitted, to be not less than three and a half times the diameter of the rivets.

5. The butts of side plating of *short* poops, topgallant forecastles and bulwarks, may be single riveted.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

6. The rivets are not to be nearer to the butts or edges of the plating, butt-straps, or of any angle iron, than a space equal to their own diameter; and, in edge riveting, the space between any two consecutive rows of rivets must not be less than once and a half their diameter.

7. The rivet holes to be regularly and equally spaced and carefully punched from the faying surfaces opposite each other in the adjoining parts, laps, lining pieces, butt-straps, and frames; and countersinking to extend through the whole thickness of the plate or angle bar. *They are to be spaced not more than four diameters of the rivet apart from centre to centre in the butts of the plating, and not more than from four to four and a half diameters apart in the edges of the plating and at other parts*, excepting in the keel, stem, and sternpost, where they may be five diameters, and through the frames and outside plating and in reversed angle irons on frames, where they may be eight diameters apart from centre to centre. The rivets in the flanges of the gunwale angle irons to be spaced not more than four and a half diameters apart from centre to centre; and those connecting iron decks and stringer plates to the beams to be spaced from seven to eight diameters apart.

8. For arrangement of rivets showing minimum number in each frame space in the edges of plating amidships, *see* Table G 5.

9. There are not to be less than four rivets in each flange of the angle irons between the frames which connect the stringer plates and intercostal plates to the outside plating, where the spacing of the frames from centre to centre is twenty-three inches and above; but, where the frames are closer spaced, there are not to be less than three rivets.

10. The rivets are to be of the best quality, and to be in diameter as per Table G 5, and to be increased in size under their heads to fill the rivet holes. When riveted up, the rivets are completely to fill the holes, their heads are to be "laid up," and their points or outer ends are not to be below the surface of the plating. Rudder rivets should be of not less size than required for the upper edge of the garboard-strake amidships, and spaced not more than five diameters from centre to centre. They should have full snap heads and points, or should be otherwise completed to the satisfaction of the Surveyor.

BULKHEADS.

Section 22. 1. Screw-propelled vessels, in addition to the engine-room bulkheads, to have a water-tight bulkhead built at a reasonable distance from each end of the vessel. In steamers 280 feet long and above, an additional bulkhead is to be fitted in the main hold about midway between the collision and engine room bulkheads, *and extending to the upper deck in vessels with one, two, or three decks, and to the spar deck in spar-decked vessels, and to the main deck in awning-decked vessels*; and in steamers of 330 feet long and above, an additional bulkhead is to be fitted in the after hold extending to the same height.

2. The foremost or collision bulkhead in all cases to extend from the floor-plates to the upper, spar, or awning deck, and its water-tightness is to be tested by hose or other means, and to be in position to the satisfaction of the Surveyors.

3. When a bulkhead is not completed at one pair of frames from the floor-plate up to its prescribed height per rule, but is recessed, stepped, or stopped at an intermediate part, the water-tightness is to be completed with iron collars or chocks forming an "iron to iron" connection, to the exclusion of cement, wood, &c.

4. The engine-room bulkheads to extend from the floor-plates to the upper deck, in vessels with one, two, or three decks; and to the spar deck in spar-decked vessels, and main deck in awning-decked vessels. The aftermost bulkhead will be required to extend to the height of the upper or spar deck, unless a different arrangement of bulkheads be approved by the Committee. This bulkhead is to be made water-tight by a stuffing box where the screw shaft passes through, and its water-tightness is to be tested by the after compartment being filled with water.

5. In sailing vessels the foremost or collision bulkhead only will be required.

6. All plating of bulkheads to be of the thickness prescribed in Table G 1; and to be fitted between two frames at each side of the vessel, and to be strongly riveted to them. Lining pieces between frames and outside plating in way of bulkheads, are to extend in one piece from the foreside of the frame afore to the aftside of the frame abaft the bulkhead frames.

7. The bulkheads to be supported vertically on one side, and horizontally on the other, with angle irons of not less size than required for the *main* frames. The vertical angles to be not more than two feet six inches apart, and their lower ends are to be well riveted to the floor-plates, or to the inner bottom plating, where a double bottom is fitted; and on the opposite side of the bulkheads the horizontal angles should not exceed four feet apart below where they are supported by a laid deck. In vessels of forty feet breadth and above, the engine room bulkheads should be additionally strengthened by a vertical web at the middle line, extending from the keelson to the hold beams, or by other means, to the satisfaction of the Committee. All such bulkheads to be caulked and made thoroughly water-tight.

8. The upper half depth of bulkhead plating may be one-sixteenth of an inch less in thickness than the lower half when the latter is six-sixteenths of an inch or above in thickness.

WOOD DECKS.

Section 23. 1. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness and fastenings as per Table G 2.

2. In all cases the margin or boundary planks of weather decks in vessels intended for the 90A class or above, to be either Teak or Greenheart.

3. If the deck is of teak, it may be *one-sixth* less in thickness than prescribed in Table G 2.

4. When the deck planks are six inches in width and under, single fastening will be sufficient; but when they are above six inches, and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts.

5. The upper deck to be fastened by screw bolts, with nuts at the under side of the angle iron of the beams, and tie-plates. The bolts must be properly sunk, *with oakum and white lead under their heads*, and be carefully covered over with turned dowels, bedded in white lead, marine glue, or other suitable composition. It is recommended that the screw bolts be galvanized. For size of bolts, see Table G 2.

6. Where diagonal plates are fitted on the beams of iron vessels, the deck planks should be scored over the diagonal plates, so as to fit close on the beams, thereby avoiding the use of wood pads.

7. Upper decks must be renewed when worn in thickness as follows, viz. :—When a deck originally required to be 4 inches thick is worn to 3 inches; $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches; 3 inches to $2\frac{1}{2}$ inches.

IRON DECKS. (See also Table G 4.)

8. Where iron decks are fitted of six-sixteenths of an inch in thickness and under, and no wood deck is laid on the same, beams of angle iron, or angle bulbs, of the sizes given in Table G 3, are to be fitted to every frame, except at the ends of the hatchways, where they are to be of bulb iron, of the size required by the Rules for vessels of the same breadth having no iron deck. Where these angle irons or angle bulbs are fitted to every frame, a stringer is to be fitted at the middle line of the vessel to the under side of the iron deck, formed of a bulb plate scored over the vertical flange of the beams, and connected to the deck by angle irons. Or, any other approved web may be fitted if extending sufficiently below the beams to admit of the pillars being riveted to the same.

9. Where iron decks exceed the above thickness, bulb iron beams may be fitted to alternate frames in the usual manner, *but angle iron or angle bulb beams to every frame, except at the ends of hatchways, are considered preferable.* Where no wooden deck is to be laid on an iron deck, angle iron half beams, of the size given in Table G 3, are to be fitted to every frame in the way of all hatchways.

10. When the deck plating is seven-sixteenths of an inch in thickness amidships, it may be reduced one-sixteenth of an inch before and abaft the half length amidships; when eight-sixteenths thick amidships, it may be reduced to seven-sixteenths for an eighth of the length before and abaft the half length, and the remainder to six-sixteenths of an inch.

11. If a wood flat be laid over an iron upper deck, it may be half an inch less in thickness than prescribed by Table; and in such cases the iron deck, if six-sixteenths of an inch in thickness, may be reduced one-sixteenth of an inch before and abaft the half length; if seven-sixteenths in thickness amidships, it may be reduced to six-sixteenths for an eighth of the length before and abaft the half length, and the remainder to five-sixteenths of an inch. *The wooden flat should in addition be efficiently secured between the beams to the iron deck.*

12. The butts of the iron deck to be double riveted for half the length amidships; and, where large openings are cut in iron decks, compensation is to be given for the same.

13. If a wood flat be laid over an iron middle deck, it may be $2\frac{1}{2}$ inches in thickness.

14. Where a vessel has an iron deck for half her length amidships, or beyond, *but not a complete iron deck*, or where there are one, two, or three iron decks; or one, two, or three iron decks, and in addition, a partial iron deck, as before described, the same will be inserted in the Register Book thus—
pt Iron dk; 1 Iron dk; 1 Iron & pt Iron dk; 2 Iron dks; &c., &c., as the case may be.

DOUBLE BOTTOMS.

Section 24. 1. Vessels fitted with a double bottom for the purpose of water-ballast extending throughout the whole or part of the length of the vessel, will have the same denoted in the Register Book, together with its length and capacity. (*See Key to Register Book.*)

2. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but, where partial double bottoms are fitted, these keelsons are to extend into or scarph the double bottom not less than three spaces of frames, and be connected to the longitudinal girders where practicable.

3. "Manholes," with wrought-iron covers, must be constructed, or provision made for the removal of a portion of the plates so as to enable the inner surface of outside plating, the frames, floors, keelsons,

and rivets to be thoroughly examined and coated when required, and in way of the manholes in the inner bottom plating, doubling plates or rims should be fitted to receive the fastening of the covers. The double bottom to be made water-tight, and all water-tight joints to be tested on completion with a head of water at least equal to the extreme draught of water of the vessel.

4. All water-tight joints to have the surfaces of iron fitted close to each other and caulked, without, as far as practicable, the use of felt, canvas, &c.

5. The upper side of the plating must be protected with wood planking as ceiling, in no case to be less than $2\frac{1}{2}$ inches in thickness, the same to be laid on battens, to admit of drainage water passing to the well.

6. Where a double bottom extends through the engine and boiler space, a *well* should be formed between the engine-room after bulkhead and the floor immediately before the same, for the drainage of water, or *open gutter* ways of sufficient size should be made in the wings, so as to be always accessible.

7. All loose ceiling on double bottoms to be removed, when the tanks are required by the Rules to be tested.

8. It is of importance that ample provision should be made for the free passage of air from one division to another, so that it may readily find its way to the air pipes. This should be done by fitting the liners short, setting down the angle iron from the inner bottom or top of deep tank wherever necessary, and leaving, otherwise, a sufficient number of holes as near to the inner bottom as practicable. The air pipes should also be sufficient in number and size; and, wherever necessary, one should be fitted at each end of each tank on both sides of the vessel.

9. No class will be assigned to vessels having a double bottom, or part double bottom, unless such double bottom, or part double bottom, be constructed in accordance with the requirements of the Rules, or of strength equal to that prescribed thereby.

10. For record of double bottoms, &c., in the Register Book, *see* the Key to the Register in the Appendix to the Rules.

DOUBLE BOTTOMS FORMED WITH GIRDERS ON TOP OF ORDINARY FLOORS.

11. Where double bottoms are fitted with longitudinal girders extending on top of ordinary floors, the inner or second bottom must be efficiently constructed and made water-tight; the plating of it not to be less than five-sixteenths of an inch in thickness, where the vessel's number is under 11,000; if of that number or above, it is to be six-sixteenths of an inch in thickness, and the flange or side plate in each instance must be one-sixteenth of an inch thicker. The double bottom to be efficiently connected to the outside plating and frames of the main body of the vessel; and when reversed frames are cut, they must be compensated for by doubling the frames with short angle irons of their own size. The butts of the flange-plate to be double riveted; the butts and edges of the remaining plates may be single riveted.

12. Where double bottoms are fitted in the fore and after holds, and not extended through the engine-room, great care should be taken to provide against an abrupt termination in the longitudinal girders; they are either to be carried through the engine-room, or fully compensated for, by connection with the longitudinal engine and boiler bearers, or otherwise, to the satisfaction of the Surveyor. *The longitudinal girders should be connected to double reversed angle irons on the floors.*

13. Where double bottoms, or part double bottoms, are fitted with longitudinal girders on the floors, all the outside plating (except the garboard strakes) which is entirely within the boundary of them may be one-sixteenth of an inch less in thickness than that prescribed in Table G 1, provided that thickness be ten-sixteenths of an inch or more.

CELLULAR DOUBLE BOTTOMS.

14. The scantlings of the various parts of the double bottom are to be as given in Table G 6, and the spacing of the longitudinal girders should be from 42 inches to 54 inches, according to the size of the vessel.

15. In vessels whose plating number is 17,000 and under, triangular bracket plates of the thickness given in Table G 6 may be fitted at alternate frames; but under the engines, solid floor plates of the same thickness, lightened by manholes, and with double angle irons on the upper edge, are to be fitted at every frame, and at alternate frames under the boilers. Where the plating number exceeds 17,000, instead of bracket plates, solid floor plates lightened by manholes are to be fitted throughout the whole length of the double bottom. In all vessels where flat plate keels are adopted, and in vessels having hanging keels whose plating number is 22,000 and above, bracket plates are to be fitted to the centre girder at the intermediate frames, and in all vessels, bracket plates inside and outside the double bottom are to be fitted to the margin plate to every frame all fore and aft.

16. Intermediate angle irons are to be fitted for stiffening the inner bottom plating, unless the longitudinal girders are more closely spaced than given above and solid floors are fitted to alternate frames, when they may be dispensed with, if approved by the Committee.

17. Hanging keels, when adopted with this system of construction, are to be formed of side plates on each side of the centre girder, which is to extend down to the lower edge of keel.

18. The inner bottom plating to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and of the butts of the longitudinal girders, and the edges to be shifted well clear of the latter.

19. The butts and edges of the middle line strake, all fore and aft, and also the butts of the inner bottom plating in the engine and boiler space, are in all cases to be double riveted. Where the plating number is 20,000 and under 30,000 the butts of the inner bottom plating are to be double riveted for half the vessel's length amidships. Where the plating number is 30,000 and under 38,000, the butts of the inner bottom plating, and the edges of an additional strake on each side of the middle line, are to be double riveted throughout.

20. The butts of the side girders and margin plate are to be double riveted; and in vessels whose plating number is under 21,000, the butts of the centre girder are to be connected by double butt straps, double riveted. When the plating number exceeds 21,000, the butts are to be treble riveted, with the alternate rivets in the back row omitted. The double butt straps, in all cases, to be each not less than two-sixteenths of an inch thicker than half the thickness of the plates they connect.

21. The rivets in the butts and edges of the inner bottom plating and girders are to be spaced not more than four diameters apart.

22. Manholes are not to be cut in the centre girder, and the manholes in the side girders are to be shifted well clear of each other transversely, and of the manholes in the inner bottom plating, and also clear of all butts. The manholes in the floor plates, side girders, and inner bottom plating, are to be no larger and not more numerous than necessary to render all parts of the double bottom readily accessible. The edges of the manholes should be fairly smooth to enable them to be entered with facility.

23. The bulkheads are to be connected to the inner bottom plating by double angle irons, of the size required for the reversed frames, and to be caulked and made watertight.

24. In this system of construction, no reduction of thickness in the plating from the requirements of Table G 1 will be allowed where the floors are not spaced to every frame.

CELLULAR DOUBLE BOTTOMS HAVING CONTINUOUS FLOORS FROM CENTRE GIRDER TO MARGIN PLATES.

25. When double bottoms are constructed with solid floor plates lightened with manholes fitted to every frame, and continuous in one length from the middle line to the margin plate, the scantlings are to be as given in Table G 6, and intercostal plates are to be fitted about midway between the centre girder and margin plate, and well connected to the floors and to the inner and outer bottom plating.

26. In this system of construction the outside plating (except the garboard strakes and flat keel plates), which is entirely within the boundary of the double bottom, may be reduced as hitherto admitted in double bottoms with ordinary floors.

27. Any other plan of fitting double bottoms may be adopted, provided in the first instance it receives the approval of the Committee.

CEILING.

Section 25. 1. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed. From the upper part of the bilges upwards, either batten and space or close ceiling may be adopted, but the former is considered preferable.

2. The ceiling on the floors is to be made in hatches where practicable, of convenient sizes, and, when not so arranged, to be fastened to the reversed angle irons or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. For thickness of ceiling, *see* Table G 2.

4. Vessels engaged *exclusively* in the coal trade will not be required to have cargo battens fitted.

ENGINE SPACE.

Section 26. 1. In vessels propelled by machinery, care must be taken that the engine and boiler bearers are properly constructed, having efficient longitudinal ties; and, where the bearers may interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space, to compensate for such interruption.

2. Where it is intended to fit engines of greater power than is done in ordinary cargo carrying steamers, the engine seating should be of proportionately greater strength, and be specially adapted with this object in view by being connected to the sides of the vessel; and other means adopted to ensure greater rigidity and strength to withstand the extra vibration produced in this part of the vessel. The after floor-plates should also be extended well above the screw-shaft, and the after lengths of outside plating attached to the stern-frame should be of not less thickness than the plates in the same range amidships. More than usual care should be bestowed in ensuring sound riveting and workmanship at this part; and it is recommended that the after frames be sufficiently apart transversely to admit of this being effected.

3. When the machinery and boilers are fitted, as many *upper*, *middle*, and hold or lower-deck beams of extra strength, having double angle irons at upper and lower edges of the sizes, as per Table G 3, are to

be introduced as may be practicable ; and the vessel to be otherwise made secure where necessary in the engine-room, to the satisfaction of the Surveyors.

4. In the engine and boiler space, double reverse angle irons must be fitted to every floor, from bilge to bilge ; and in vessels where the number for plating is 15,000 and above, or the depth from the hold beams is 15ft. or above, they are to extend sufficiently high to admit of the bilge stringer angle irons being riveted to them, unless the bilges are otherwise additionally strengthened by web-frames. Where the number is 16,000 and under 18,000, not less than three web-frames are to be fitted on each side, formed of plates of not less than the thickness of the frames, and sufficiently broad to receive double angle irons on their inner edge, passing within the bilge stringer angle irons and to scarp the ends of the floors, and extend to the deck next above the hold beam stringer plate. Where the number is 18,000 and under 30,000, these web-frames are not to be more than from 8 to 10 feet apart, and where the number is 30,000 and above, they are not to exceed 8 feet apart. And the whole of the reverse frames in way of the engine and boiler space, in vessels where the plating number is 18,000 and above, are to extend to the upper deck, or the web-frames should be extended to this height. The web-frames are to be fitted in way of the deck beams when practicable, and if fitted between the beams they are to be connected to the stringer plate by bracket knees above and below the same.

5. Where it is desired to adopt other plans than the foregoing for maintaining the necessary rigidity in the engine and boiler space, sketches of the same must be submitted for the approval of the Committee.

SHAFT TUNNEL.

6. The plating of shaft tunnels to be from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch in thickness, in proportion to the size of the vessel : the top plating in way of the hatchways to be not less than $\frac{1}{8}$ of an inch thicker than the remaining plates, or to be covered with wood not less than two inches thick. The tunnel to be additionally strengthened with transverse angle irons not more than four feet apart, of the size of the reversed frames, and the plating to be caulked, and the tunnel to be made water-tight. The recess bulkhead and top plating to be strengthened and supported by similar angle irons, but spaced the same as the vessel's frames ; the top plating where attached to the sides of the vessel to be made watertight with iron collars or chocks to the exclusion of wood or cement. The tunnel to be fitted with a water-tight sluice door on the engine room bulkhead, capable of being closed from the upper deck.

COCKS, VALVES, AND SOIL PIPES.

Section 27. 1. A sluice cock or valve is to be fitted at the limbers, at each water-tight bulkhead, to allow water to be shut off, or to reach the pumps when required ; the same to be fitted, so as to be controlled above the load water-line, and to be boxed in, to prevent injury.

2. The shut-off valves or cocks of all openings for the inlet or outlet of water, in connection with the engines and boilers, are to be fitted close to the vessel's sides, and are to be accessible at all times.

3. All head and stern pumps to be efficiently provided with stop-cocks, to the satisfaction of the Surveyors.

4. Where soil pipes are attached to the outside plating below the load water line, the lower length must be of iron of substantial thickness, and be secured to the plating with a proper faced-joint, and extended for some distance above the load water-line.

5. If the remainder of the pipe be of lead, care must be taken that it be of substantial thickness,

and that it be properly protected externally with either zinc or iron, to the satisfaction of the Society's Surveyors.

HATCHWAYS AND MAST PARTNERS.

Section 28. 1. All hatchways are to be properly framed to receive half-beams where required, and the mast-holes to have partners at the upper deck and at the tier of beams where the masts are wedged, the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than twice the diameter of the masts. These plates are to be well riveted to each other, and to the beams; and at the decks, where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast-holes.

2. It is recommended to have only one large angle iron on the beams where comings are intended to be fitted of sufficient size to compensate for double angle irons, the angle iron to be on the side of the beam that will be clear of the hatchway space. Plates are to be fitted and riveted to these beams, where necessary, in order that the ends of the deck may be properly fastened.

3. Where upper deck hatchways are above twelve feet and not exceeding sixteen feet in length, strong shifting beams are to be fitted with proper means for firmly securing the same. Where the length is above sixteen feet and not exceeding twenty feet, a deep web-plate is to be fitted between double angle irons, at the middle of the length, extending the depth of the comings and carlings; and the fore and aft tie-plates in way of the same, and extending two spaces of beams beyond each end of the hatchway or opening, are to be double the width of that given in Table G 4, or such other arrangement as may be considered equal thereto may be adopted, if approved by the Committee. When the length exceeds twenty feet, a deck plan is to be submitted for the approval of the Committee, showing the necessary additional transverse strength proposed to be applied, by increasing the number of web-plates, and either increasing the width of the stringer and tie-plates, or by plating the beams in way of the same, as the case may require. Where iron decks are fitted, as required by the Rules, additional strength is to be applied around all hatchways of twenty feet and above, either by doubling the plating, or by fitting plates of the breadth and thickness required for tie-plates in Table G 4.

4. All hatchway comings on weather decks and the companions at the fore-end of steamers to be of iron.

5. In all cases where half-beams are required, fore and aft carlings of the same size and description as the hatchway beams, are to be fitted in the hatchway spaces; the plates forming the comings and head ledges are to be of sufficient strength in proportion to their size, and are to extend to the lower edge of the beams and carlings, and must be riveted to them, excepting that when the beams are of bulb iron they may then terminate on the bulb; where coming plates are of extra thickness the carlings may be dispensed with. (*See sketches after page 84.*)

6. Half beams are to be fitted to alternate frames between the hatchway beams, and their ends are to be secured by the angle irons on their upper edges being made knee-shaped, and fitted and riveted to the fore and aft carlings or comings. In addition, fore and aft tie-plates are to be fitted close to the comings and riveted to the beams and half beams. An angle iron with its flange of sufficient depth to extend half an inch above the deck, is to be fitted and riveted to the comings and head-ledge plates, and to the beams and tie-plates; its upper edge to be properly caulked, and the rivets used in its vertical flange to be countersunk and flush-headed.

7. In vessels having long hatchways for the purpose of "self trimming," wing boards are to be fitted to the approval of the Committee, to prevent the shifting of cargo.

8. The hatches of steamers to be solid, not less than $2\frac{1}{2}$ inches in thickness.

ENGINE AND BOILER OPENINGS.

Section 29. 1. The engine and boiler openings of the weather deck of steam vessels are to be properly framed for a height of not less than eighteen inches above the deck, the coming plates to extend to the lower edge of the beams, and iron trunk bulkheads connected to the comings should be fitted to a height of about seven feet above the deck; the thickness of the same, where exposed, to be not less than that required for the side plating of poops, and to be efficiently stiffened by vertical angle irons of the size of the reversed frames thirty inches apart, connected to the coming plates. The thickness of the comings to be one-sixteenth of an inch more than required for the trunk bulkheads. Where the trunk bulkheads are enclosed by a complete bridge house extending to the sides of the vessel, and efficiently protected from the force of the sea, a reduction from the above thickness might be admitted, provided in such cases a plan showing the proposed arrangement be furnished for approval. (*See sketches after page 84.*)

2. The engine and boiler openings in the 'tween decks of all vessels are also to be enclosed by trunk bulkheads efficiently stiffened by angle irons and extending to the weather deck beams, to which they are to be secured.

3. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least eighteen inches above the deck, and efficient arrangements made for their security.

4. When a poop, bridge house, or awning deck covers the engine and boiler space, the comings of the engine and boiler openings should not be less than two feet above such deck, unless these openings are constructed as provided for in the first paragraph of this section.

5. It is considered that in all cases the engine and boiler openings should be made as small as practicable, and be subdivided by athwartship iron divisional casings to secure the maximum safety of the vessel. The two sides of the casing should in all instances be efficiently connected by angle iron beams within them at the upper part.

6. The engine room skylights are to be in all cases substantially constructed and to be securely bolted or riveted to the comings, and where the skylight top is not solid with bull's eyes fitted in the same, efficient deadlights of iron or wood must be provided. The grating openings over the stokehold must also be protected by iron plates, fitted with hinges, or otherwise in manner satisfactory to the Surveyors.

7. Where either the engine or boiler opening on the upper deck exceeds twelve feet long, or the combined length exceeds twenty-four feet, plans for giving additional strength in way of the same are to be submitted for the consideration of the Committee.

8. Where either of the openings exceeds fifteen feet, or the combined length exceeds thirty feet, the beams in way of the same are to be plated over from the stringer to the tie-plates, the plating extending two beam spaces beyond the openings, and tapered from thence towards the stringer plate for a distance not less than the breadth of the plating required to be fitted; the thickness of this plating to be the same as given in Table G 4 for iron decks.

9. Where large openings are adjacent to each other, the space between should be plated over wherever practicable.

COAL BUNKER PIPES AND LIDS.

Section 30. Coal bunker pipes, where practicable, are to be formed so as to be at least twelve inches above the upper deck, fitted with lids having studs to fit in openings made in the pipes, for their security; the pipes to be so formed that tarpauling may be securely lashed over them. Where there are coal bunker hatches in the weather deck they must be properly framed with iron comings of suitable height having solid hatches secured by an iron bar or other approved fastening.

PORTS AND SCUPPERS.

Section 31. 1. All vessels must be fitted with a sufficient number of ports and scuppers, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges, and the scuppers formed in the vertical flange of the upper deck stringer angle iron, which is to be increased in depth, so as to enclose the scuppers; or any other equally efficient plan may be adopted.

2. Where the bulwark plating and roughtree rail are cut through to form a cargo port, the bulwark stays at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

3. A sufficient number of scuppers, with proper pipes attached to them, are to be fitted in all 'tween decks to convey water or leakage to the bilges.

VENTILATORS.

Section 32. 1. It is recommended that ventilators, sufficient in number and size, be efficiently fitted to the upper deck of all vessels.

2. When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided; these covers to be efficiently fitted, to the approval of the Surveyors.

3. Where scuttles are fitted in the sheerstrake within three-fifths of the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle iron over them.

CHAIN PLATES.

Section 33. The chain plates to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

BITTS.

Section 34. All bitts, when not of iron, and which do not go down to the deck below, to be fitted into iron sockets fastened through the deck to plates riveted to the beams.

CEMENT.

Section 35. The frames and plating of the bottom of all vessels to the upper part of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper substance of cement at its termination, and to keep the watercourses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

RUDDER.

Section 36. The rudder to be made to ship and unship while the vessel is afloat. The size of main piece, given in Table G 2, to be regulated by the number which regulates the thickness of the vessel's plating; it is to be of the best hammered iron. The frame of the rudder and main piece to be one forging; the frame to be properly stayed by wrought-iron stays welded on the frame, and to be carefully plated and riveted. It is recommended that the pintles be made independent of the frame. They should

be spaced not more than from 4 feet to 5 feet 6 inches, and the upper one should be placed as near as practicable to the rudder trunk, and the rudder plates should be secured to the frame with rivets of not less size than required for the upper edge of the garboard strake amidships, and spaced not more than five diameters from centre to centre. They should have full snap-heads and points, or should be otherwise completed to the satisfaction of the Surveyors. All vessels to have a spare tiller and gear ready for use if required. (See footnote to Table G 5.)

WINDLASS AND HAWSE-PIPES.

Section 37. 1. The windlass, for all grades, if of wood, may be composed of either of the following timbers; namely, English, African, or Live Oak; Adriatic, Italian, Spanish, Portuguese, or French Oak; East India Teak, Morung Saul, Greenheart, Morra, or Iron Bark. The iron spindle in all cases to pass through the body of the windlass.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass, or capstan.

PUMPS.

Section 38. 1. In addition to the engine pumps in steam vessels, an efficient pump is to be fitted in the bilges, on each side of the vessel, to each cargo compartment, capable of being worked from the upper or main deck, or such other arrangement may be adopted as may, when submitted to the Committee for their approval, be deemed satisfactory by them. A doubling plate should be fitted under all sounding pipes.

2. In the case of new steam vessels plans of the various compartments, showing the intended arrangement of the bilge suction pipes, sluices, and roses connecting the main and donkey engine pumps with these compartments, are to be submitted, in the first instance, for the approval of the Committee.

EQUIPMENT.

Section 39. 1. All vessels are required to have their masts, spars, and rigging in good order, and sails in sufficient number and in good condition.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, properly tested at a public machine, in number and length, as set forth in the Table No. 22 annexed.

3. In cases, however, where anchors and chain cables are manufactured abroad and supplied to foreign owned vessels, and testing certificates are furnished setting forth that the anchors and chain cables have been tested at a Government machine, or a machine under the control of a municipal body, or a similar responsible body, such certificates will be accepted as complying with the requirements of the Rules for obtaining the figure 1, provided the remaining requirements of Table 22 be complied with, but in these cases the record of A.&C.P. will not be made in the Register Book.

4. A certificate of all chains and anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the figure 1.

5. The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the upper deck beams, and the girth of the half midship section to the

same height, multiplied by the length for a one, two, and three-decked vessel, and for a spar-decked vessel. For a vessel having a complete awning-deck, or a continuous shade deck, the equipment number is to be increased one-eighth beyond what it would be if the vessel were flush decked.

6. For a steam vessel with a partial awning deck, poop, top-gallant forecastle, bridge-house, or a raised quarter-deck, the equipment number is to be increased beyond that for a flush or spar-decked vessel by that proportion of the addition made for a complete awning deck, which the combined length of the erections bears to the length of the vessel.

7. All vessels under 150 tons to be provided with one good boat; and every vessel of 150 tons, and above, to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

8. In ships navigated by steam, the boilers and machinery are to be considered as part of the equipment, and unless the Surveyors are satisfied of their efficiency, the figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See page 66.*)

9. The efficient state and condition of the whole of the ship's equipment will be designated by the figure 1; and where the same is found insufficient in quantity, or defective in quality, by a dash thus — following the character assigned to the ship.

DEFECTIVE EQUIPMENT.

10. In the case of a steam vessel already classed of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel in the Register Book, but where in the opinion of the Committee the machinery or boilers are deemed so far inefficient or defective as to imperil the vessel's safety, the figure 1 will be withheld, and a red ring inserted in place thereof; and in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the figure 1 for equipment; as described in the foot-note on the page of the Register Book, and in the Key thereto.

REPORTS ON VESSELS.

Section 40. 1. The Surveyors, in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.

2. Builders wishing to adopt plans other than those described herein, are to submit them through the Resident Surveyors (who are to state their opinions thereon), for the Committee's consideration and approval.

THREE DECKED STEAM-VESSELS.

Section 41. 1. Steam vessels not less than 15 feet depth of hold to the middle deck, having two or more complete decks laid and caulked, and a tier of held beams, or extra strong beams, or web frames

and stringers in lieu thereof, will have their scantlings determined as follows:—Such vessels to be denoted in the Register Book, “3Dks,” or “2Dks3trB.,” or “2Dks&web frames,” as the case may be.

2. The scantlings of the frames, reversed frames and floor-plates, the thickness of bulkheads, and diameter of pillars, are determined by the number produced by the deduction of *seven feet* from the sum of the measurements in feet, arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the *upper deck beams*, and the girth of the half midship frame section measured from the centre line at the top of keel to the *upper deck stringer* plate.

3. The scantlings of the keel, stem, sternpost; the thickness of the outside plating, keelson and stringer plates, and deck; also the scantlings of the angle irons on beam stringer plates, and keelson and stringer angle irons in hold, as in Tables G 1, G 2, and G 4, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

4. All the frames are to extend to the upper deck stringer plate.

5. The reversed frames are to extend to the upper part of the middle deck beam stringer angle iron, and to the upper part of the frames alternately.

6. The plating to be of the thickness given in Table G 1 from the keel to the gunwale; the sheerstrake to be placed at the gunwale, and the strake of plating in way of the middle deck to be an outside strake.

7. The upper deck stringer plate to be of the breadth and thickness prescribed in Table G 4. The middle deck stringer plate to be of the same breadth, and one-sixteenth of an inch less in thickness, and it is to be fitted and connected to the outside plating by angle irons between the frames of the size given for beam stringer angle iron; and in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate—the space between this angle iron and the outside plating, all fore and aft, to be filled in and made watertight. Similar angle irons are to be riveted to the stringer plate, reversed frames, and outside plating, at the lower deck stringer.

8. The butt-straps of the sheerstrake and upper and middle deck stringer plates, and of not less than three strakes of plating at the bilge, to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted, for half the vessel's length amidships, and otherwise as per Section 20.

9. In these vessels, a side intercostal keelson is to be fitted and attached to the outside plating by angle irons of not less size than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above, then these angle irons must not be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

10. The thickness of the flat of upper deck is to be as given in Table G 2. In all cases a middle deck is to be properly laid and caulked, the thickness of which may be one-half inch less than that prescribed for the upper deck.

11. Engine room hatchways on the middle deck are to be enclosed by iron trunk bulkheads, efficiently strengthened, and extended from the middle deck to the upper deck, as prescribed in Section 29.

12. If in such vessels the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *middle deck beams*, additional strength will be required at the bilge and bottom, as per Section 46; but no additional strength at the sheerstrake and stringer plate will be needed until the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *upper deck*

beams; when this is the case, additional strength will be required in the upper deck sheerstrakes, as per Section 46, relating to vessels' proportions.

SPAR-DECKED STEAM VESSELS.

Section 42. 1. Vessels noted in the Register Book as "Spar-deck" are those which are of lighter construction * than vessels built under the Three decked rule, having the same dimensions, taken with reference to the total depth to the spar or upper deck in either case.

2. They must have three tiers of beams and be not less than 15 feet depth of hold to the main deck. The Committee, however, will approve of the construction of Spar-deck vessels having a less depth of hold provided the plans be in the first instance submitted for approval. For such vessels, having less than 15 feet depth of hold, a minimum freeboard must also be submitted to the Committee for approval, and the freeboard sanctioned is to be inserted in the Certificate and in the Register Book and marked on the ship's sides.

3. In cases where erections are required on the spar deck, plans must be submitted showing the additional strengthening proposed, which must be to the satisfaction of the Committee.

4. In such vessels the scantlings and arrangements are to be regulated by the dimensions under the main deck, as in those having one or two decks.†

5. All the frames must extend to the spar-deck stringer plate.

6. The reversed angle irons on the frames are to extend to the upper part of the main deck beam stringer angle iron, and to the upper part of the frames, alternately.

7. When the plating number is under 13,100, the plating from the main to the spar-deck sheerstrake must not be less than six-sixteenths of an inch in thickness; if 13,100 and under 16,600, it must not be less than seven-sixteenths of an inch in thickness; and if 16,600 and under 30,900 it must not be less than eight-sixteenths of an inch; and if 30,900 or above, it must not be less than nine-sixteenths of an inch in thickness.

8. A reduction of two-sixteenths of an inch from the thickness required by Table G 1 for the main-deck sheerstrakes, and from that given in the upper line of Table G 4 for stringer and tie-plates, will be allowed for those of the spar-deck.

9. The butt-straps of the spar and main-deck sheerstrakes and stringer plates, and of not less than three strakes of plating at the bilges, to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted for half the vessel's length amidships, and otherwise as per Section 20.

10. In these vessels, a side intercostal keelson is to be fitted, and attached to the outside plating by angle irons of not less than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above, then these angle irons must not be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

11. The lower edge of the main sheerstrake must not be more than one-half its depth below the main-deck stringer plate.

12. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle irons

* This does not necessarily imply that the vessel is of less strength in relation to the amount of dead-weight carried at a suitable load line.

† Where the height between the main and spar decks is eight feet or above at any part additional transverse strength will be required to the satisfaction of the Committee.

between the frames, of the size given for beam stringer angle iron, and in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate; the space between this angle iron and the sheerstrake, all fore and aft, to be filled in and made water-tight. Similar angle irons are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck.

13. These vessels are to have a complete main deck $3\frac{1}{2}$ inches in thickness, properly laid and caulked; and a main deck sheerstrake of the thickness prescribed by Table G 1.

14. The flat of spar deck to be not less than $3\frac{1}{2}$ inches in thickness.

15. Engine-room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the spar deck. (See Section 29.)

16. The measurement of depth, for regulating the additional strength required for vessels of extreme proportions given in Section 46, is to be taken from the upper part of keel to the top of the *main deck beams*.

17. When Section 46 (relating to vessels' proportions) applies to these vessels, the increased strength defined for sheerstrakes is to be added to those of either the spar or main deck.

18. They are to have extra strength at the bilge and bottom in the proportion of their length to depth from main deck as prescribed in Section 46; they may, however, be 12 and under 13 depths in length before they are required to have the remaining extra strength prescribed for vessels of 11' to 12 depths in length, and such vessels exceeding the above proportions to have extra strength in the same relation to that prescribed for one and two-decked vessels.

19. Vessels to which this rule applies, as regards an entire spar deck, will be noted in the Register Book thus:—"Spar dk."

AWNING-DECKED STEAM VESSELS. (See N.B. at foot.)

Section 43. 1. An awning-decked vessel is one having a comparatively light superstructure fore and aft on the main deck proper of the vessel, intended to shelter passengers or cattle, or for the conveyance of cargo, either light in its nature or limited in quantity. In such vessels the scantlings and arrangements of the frames, reversed frames, the thickness of bulkheads, and diameter of pillars in Table G 1, are to be regulated by the dimensions under the main deck, as in a one or two-decked vessel, exclusive of the awning deck.

2. The plans of such vessels and a minimum freeboard must be submitted to the Committee for approval, and the freeboard thus sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the ship's sides.*

3. Awning-decked vessels loading to a greater draught of water than thus indicated will thereby lose their character in the Register Book.

4. Vessels to which this rule applies, as regards an entire awning deck, will be noted in the Register Book thus, "*Awng dk.*"

* See Circular, No. 354, page 180 of Rules.

N.B.—It is a condition on which an awning-decked vessel is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as above prescribed; and, under the provisions of Section 43 of the Society's Rules for Iron Ships, if the vessel be loaded to a greater draught of water than that assigned by the Committee, or if the mark indicating the maximum load draught be placed higher than the position assigned by the Committee, the vessel will thereby forfeit her Character in the Register Book.

5. Such erections only as are necessary for navigating these vessels will be allowed on the awning deck, unless plans are submitted to, and approved by, the Committee.

6. All the main frames must extend to the awning-deck stringer plate, or to the lower part of the curve when of a rounded form at the gunwale. To be of the size given in Table G 1, but in no case to be less than $3 \times 3 \times \frac{6}{16}$.

7. The whole of the reversed frames are to be extended to the top of the main-deck stringer angle iron.

8. All the side plating above the main sheerstrake in vessels whose number is under 13,100 to be not less than five-sixteenths of an inch in thickness; if of that number, and under 18,700, to be not less than six-sixteenths; if of that number or above, to be not less than seven-sixteenths of an inch in thickness.

9. The awning-deck stringer plate to be of the breadth given in Table G 4 for hold beam stringers, and to be not less than six-sixteenths of an inch in thickness where the plating number is under 14,000, and seven-sixteenths where the plating number is 14,000 or above. When the number for plating exceeds 30,900, or the vessel exceeds thirteen depths in length to the main deck, special arrangements must be made for affording the requisite longitudinal strength at the gunwale, to the satisfaction of the Committee.

10. The tie plates to be of the same thickness as given above for the stringer plates, and to be in breadth as in Table G 4 for main deck tie-plates.

11. The butts of the awning-deck side plating above the main deck, and of the awning-deck stringer and tie-plates, are to be double riveted.

12. A reduction of one-fourth from the thickness prescribed for the main deck will be allowed for the flat of awning deck.

13. The beams to be of the sizes given in Table G 3. They are to be placed at every alternate frame, and, if the vessel is of a rounded form at the gunwale, to scarp the main frames not less than eighteen inches, and to be properly riveted to them.

14. Engine-room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the awning deck; and the comings to the engine-room skylight not to be less than two feet above the awning deck. (See Section 29.)

15. Rounded gunwale plating to be not less in thickness than required for the awning-deck stringer plate, and to have a gunwale angle iron of the size required by Table G 2.

16. The gunwale must be properly constructed to the satisfaction of the Surveyors.

17. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle iron between the frames, of the size given for beam stringer angle iron; and, in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate; the space between this angle iron and the sheerstrake, all fore and aft, to be filled in and made water-tight.

POOPS, FORECASTLES, AND BRIDGE HOUSES.

Section 44. 1. In full poops, forecastles, and bridge-houses, a reduction of one-fourth from the dimensions which would be required in the same range, if the vessel were flush-decked (exclusive of

additions for extreme proportions) will be allowed in the outside plating, stringer and tie-plates upon beams, angle iron on stringer plates, and flat of deck. In no case need the side plating exceed the thickness required for awning-decked vessels.

2. All frames to extend to the poop or forecastle stringer plate, or to the lower part of the curve when of a rounded form at the gunwale, and a continuous angle iron of the size given for the upper deck stringer angle iron is to be wrought on the upper deck stringer plate inside the frames, as prescribed in Section 16, paragraph 9. The beams to be of the size given in Table G 3, and they are to be efficiently pillared. A beam to be placed at every alternate frame to scarp the main frames not less than eighteen inches, and to be properly riveted to them.

3. The rounded gunwale plating may be of the thickness required for the poop or forecastle stringer plates. The gunwale must be properly constructed to the satisfaction of the Surveyors.

4. Poop and bridge-house bulkheads in steam vessels to be of the thickness of their side plating, with coming plates one-sixteenth of an inch thicker than their bulkheads, and to be stiffened with bulb plates of not less size than those required for forecastle beams, and angle irons of the size required for the vessel's reversed frames, spaced 30 inches apart, and connected both to the coming plates and to the deck plating, or to an athwartship plate on the beams both below and above, with a bracket-plate to each end of the bulb stiffener; or other equivalent strength introduced.

5. Where the poop exceeds one-fourth of the vessel's length, the upper deck stringer plate and sheerstrake are to be either increased in thickness or doubled, in way of the break, for a length of from twenty to thirty feet, or increased strength at this part may be obtained in any other way, if to the satisfaction of the Surveyors.

6. In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or a double angle iron stringer of the size required for reversed frames is to be fitted inside the frames midway between the upper and forecastle decks, connected at the fore-end by an efficient breasthook; or other equally efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

7. Where it is proposed to fit a poop or top-gallant forecastle to a vessel under 14 feet depth of hold, the plans are to be submitted for the consideration of the Committee.

8. Where bridge-houses are fitted, the whole of the frames are to be extended to the height of the bridge-deck, or be connected to the stringer plates by knees and bracket plates, and the gunwale angle iron made continuous. Where efficient partial bulkheads are fitted, the alternate frames only need extend to the height of the bridge deck. When the frames are extended through the upper deck stringer plate there must be a continuous angle iron of the size given for upper deck stringer angle irons, wrought on the upper deck stringer plate, inside the frames.

9. Where the combined length of the poop, or raised quarter-deck, and bridge-house exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake should be doubled for one-half the vessel's length amidships, or other equivalent strength should be added to the satisfaction of the Committee.

10. This additional strengthening to be given also to vessels of over 11 depths in length and whose

plating number is 15,000 and above, where a bridge-house is fitted of a length equal to or exceeding one-fifth the length of the vessel.

RAISED QUARTER DECKS AND SUNK FORECASTLES.

Section 45. 1. Side plating of raised quarter-decks and sunk forecastles may be one-sixteenth of an inch less in thickness than topside plating below it, if the topside plating be seven-sixteenths of an inch in thickness or more.

2. The frames in all cases, and the reversed angle irons on alternate frames, are to extend to the raised quarter-deck and forecastle stringer plate.

3. The upper deck beam stringer plate is to maintain its breadth to the break of the quarter-deck, and then it may be gradually reduced in breadth until it terminates at the fourth frame abaft the break and it is to be fitted and riveted to the outside plating. The upper deck sheerstrake is to extend to the stern. The front or break bulkhead of the raised quarter-deck is to be stiffened by a thwartship plate, of not less size than the upper deck beam tie-plates, and efficiently connected to it by angle iron; this thwartship plate is to receive the deck ends, and is to be supported by bracket plates when not riveted to a beam.

4. Where the raised deck is less than one-quarter of the vessel's length, a reduction of one-fifth from the thickness which would be required in the same range if the vessel were flush decked will be allowed in the stringer and tie-plates upon beams, and angle iron on stringer plates and the flat of the deck, but no such reduction is to be made where the length of the raised quarter-deck exceeds the above limits.

5. Where the raised deck exceeds one quarter of the vessel's length, the number and arrangement of the hold beams, beam stringers, and stringers in hold, must be in accordance with the Rules for the increased depth of the vessel, and the height of the reversed angle irons on the frames is to be regulated by the number of scantlings which the increased depth would give. The main sheerstake should be doubled, or increased in thickness, for a reasonable distance before and abaft the break; the side plating of the raised deck should be increased in thickness at the break, and be extended for some distance before the break; the butts of this plating, the main sheerstrake, and the strake of plating next below must be treble riveted in the neighbourhood of the break, and the butt-straps be one-sixteenth of an inch thicker than the plates they connect. The main deck stringer plate should extend abaft the break, about seven frame spaces, and the raised deck stringer plate about four frame spaces before the break, and the stringer plates below the main deck should have a shift of about sixteen feet overlap, or the necessary strength may be obtained by other arrangements if approved by the Surveyors. *The size of beams of raised quarter-decks to be regulated as prescribed in Table G 3.*

6. Where an iron deck is required to be fitted by the rules, and is severed at the break, its continuity of strength is to be maintained by efficient brackets securely attached to the break bulkhead and to the iron deck before and abaft the same, or otherwise arranged to the satisfaction of the Surveyors.

7. Where the combined length of the poop or raised quarter-deck, and enclosed bridge-house, exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake should be doubled for one-half the vessel's length amidships, or other equivalent strength should be added, to the satisfaction of the Committee.

VESSELS OF EXTREME PROPORTIONS.

Section 46. 1. In the following cases additional longitudinal strength, beyond that stated in the foregoing rules, and in Tables G 1 and G 2, will be required. For stringer plates and iron decks, *see* Table G 4.

2. *The length, breadth, and depth to be taken as per Section 1.*

3. In all cases where keelsons, or other additions, are required for a certain portion of the length of a vessel, care should be taken to avoid any abrupt termination of this additional strength, by tapering the keelsons, &c., beyond these limits, and properly shifting their terminations.

VESSELS ABOVE 11 AND NOT EXCEEDING 12 DEPTHS IN LENGTH.

4. **Plating Number under 18,700.** The sheerstrake to be increased one-sixteenth of an inch in thickness for three-fourths the vessel's length amidships.

5. To have a bulb plate of the dimensions required for the midship beam plate, placed between and riveted to, the double angle iron bilge keelson for one-half the vessel's length amidships.

6. To have one strake of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1, or one-half the vessel's length amidships.

7. **Plating No. 18,700 and under 23,000.** The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships.

8. To have a bulb plate of the dimensions of the midship beam plate, placed between and riveted to the double angle iron bilge keelson for three-fifths the vessel's length amidships.

9. And to have two strakes of plating at the bilge one-sixteenth of an inch thicker than given in Table G 1, for one-half the vessel's length amidships.

10. **Plating No. 26,000 and under 35,000.** The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships, and the strake below increased one-sixteenth of an inch for half the vessel's length amidships.

11. To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

12. To have also a bulb plate of the same size as the above, fitted to the side intercostal keelson for one-half the vessel's length amidships.

13. To have an intercostal bilge keelson fitted for half the vessel's length amidships, and attached to the outside plating. And to have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for half the length of the vessel amidships.

14. **Plating No. 35,000 and under 40,000.** The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships and the strake below it one-sixteenth of an inch for half the length amidships.

15. To have a continuous plate keelson standing on the floors and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be, in depth, sufficient to take the deep flanges of the double angle irons on top and bottom and to be the same thickness as that given in Table G 2 for middle line keelsons, and to extend for one half the vessel's length amidships.

16. To have an intercostal bilge keelson fitted for half the vessel's length amidships, and attached to the outside plating. To have a bulb plate of the size required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

17. And to have intercostal plates fitted between the upper bilge stringer angle irons, and attached to the outside plating for three-fifths the vessel's length amidships.

VESSELS ABOVE 12 AND NOT EXCEEDING 13 DEPTHS IN LENGTH.

18. **Plating No. under 18,700.** The sheerstake to be increased in thickness two-sixteenths of an inch, for three-fourths the vessel's length amidships.

19. To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

20. To have two strakes of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1, for one-half the vessel's length amidships.

21. **Plating No. 18,700 and under 26,000.** The sheerstake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships, and the strake below it one-sixteenth of an inch for half the length amidships.

22. To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

23. And to have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or to have in lieu thereof three strakes of plating at the bilge one-sixteenth of an inch thicker than required by Table G 1, for the same length.

24. **Plating No. 26,000 and under 35,000.** The sheerstrake and the strake below it to be increased two-sixteenths of an inch in thickness for three-fourths and one-half the vessel's length amidships respectively, and the upper deck stringer plate to be increased one-sixteenth of an inch in thickness for three-fifths the vessel's length amidships.

25. To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

26. Also to have a bulb plate of the same size as the above, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships. To have an intercostal bilge keelson fitted for half the vessel's length amidships and attached to the outside plating.

27. And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

28. **Plating No. 35,000 and under 40 000.** The sheerstrake to be doubled below the stringer plate with plates not less than 20 inches broad in long lengths and of the thickness of the topside plating, for

three-fourths the vessel's length amidships, and the upper deck stringer increased two-sixteenths of an inch in thickness for half the length amidships.

29. To have a continuous plate keelson standing on the floors and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be, in depth, sufficient to take the deep flanges of the double angle irons on top and bottom, and to be the same thickness as that given in Table G 2 for middle line keelsons, and to extend for one-half the vessel's length amidships.

30. To have intercostal plates fitted and attached to the outside plating at the bilge keelson for one half the vessel's length amidships, and to have a bulb plate of the same size as that given above, attached thereto, and to the keelson angle irons, for three-fifths the vessel's length amidships.

31. To have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for three-fifths the vessel's length amidships.

VESSELS ABOVE 13 AND NOT EXCEEDING 14 DEPTHS IN LENGTH.

32. **Plating No. under 10,450.** The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths of the vessel's length amidships, and the strake next below it to be increased one sixteenth of an inch for one-half the vessel's length amidships.

33. To have a bulb plate of the dimensions required for the midship beam plate, placed between and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

34. To have also an additional bulb plate of the same size as above, fitted between the upper bilge stringer angle irons for one-half the length of the vessel amidships.

35. To have in all cases a side keelson formed of double angle irons, about midway between the bilge and middle line keelson.

36. And to have two strakes of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1, for one-half the vessel's length amidships.

37. **Plating No. 10,450 and under 15,500.** The sheerstrake to be doubled below the stringer plate with plates not less than 18 inches broad in long lengths, and of the thickness of topside plating, for three-fifths of the vessel's length amidships.*

38. To have a bulb plate of the dimensions required for the midship beam plate, placed between and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

39. Where hold beams are not fitted, there is to be an additional bulb plate of the same size as the above fitted between the upper bilge stringer angle irons for one-half the length of the vessel amidships.

40. To have also a side intercostal keelson fitted between double side keelson angle irons, and attached to the outside plating, extending as far forward and aft as practicable.

41. In addition to the above, two strokes of plating at the bilges are to be one-sixteenth of an inch thicker than given in Table G 1, for one-half the vessel's length amidships.

42. **Plating No. 15,500 and under 18,700.** The sheerstrake to be doubled below the stringer plate with plates not less than 20 inches broad, in long lengths, and of the thickness of the topside plating, for three-fifths the vessel's length amidships.

43. To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

* When it is required to double the sheerstrake for a portion of its breadth, the topside strake may in lieu thereof be doubled its whole breadth for the same length.

44. And to have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof three strakes of plating at the bilge are to be increased one sixteenth of an inch in thickness beyond that required by Table G 1, for the same length.

45. **Plating No. 18,700 and under 26,000.** The sheerstrake to be doubled below the stringer plate with plating not less than 20 inches broad, in long lengths, and of the thickness of the topside plating, for three-fifths the vessel's length amidships, and the upper deck stringer plate to be increased one-sixteenth of an inch in thickness for one-half the vessel's length amidships.

46. To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths of the vessel's length amidships.

47. And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

48. **Plating No. 26,000 and under 35,000.** The sheerstrake to be doubled below the stringer plate with plates not less than 20 inches broad, in long lengths, and of the thickness of the topside plating, for three-fourths the vessel's length amidships, and the stringer plates increased two-sixteenths of an inch for three-fifths the vessel's length amidships.

49. To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

50. To have a bulb plate of the size required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

51. To have intercostal plates fitted and riveted between the bilge keelson angle irons and attached to the outside plating for half the vessel's length amidships.

52. To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

53. And the middle line keelson in these vessels to be one-fourth deeper than required by Table G 2 for half the length amidships, tapered forward and aft to the depth given in the Table.

54. **Plating No. 35,000 and under 40,000.** The sheerstrake to be doubled its whole depth as far as practicable for three-fourths the vessel's length amidships, the next strake below it increased two-sixteenths of an inch in thickness for half the vessel's length, and the upper deck stringer plate increased two-sixteenths of an inch for three-fifths the vessel's length amidships.

55. To have a continuous plate keelson standing on the floors and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth given in Table G 2 for middle line keelsons, and the same thickness, and to extend for one-half the vessel's length amidships.

56. To have an intercostal bilge keelson attached to the outside plating for half the vessel's length amidships; and to have a bulb plate of the same size as that given above attached thereto, and to the keelson angle irons, for three-fifths the vessel's length amidships.

57. To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

58. The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2 for one-half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

VESSELS ABOVE 14 AND NOT EXCEEDING 15 DEPTHS IN LENGTH.

59. **Plating No. under 10,450.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than eighteen inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

60. To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

61. To have a bulb plate of the same size as the above fitted between the upper bilge stringer angle irons for one-half the vessel's length amidships.

62. To have in all cases a side keelson formed of double angle irons, about midway between the bilge and middle line keelson with a bulb plate between of the size given above.

63. And to have an intercostal stringer fitted at the upper turn of bilge and attached to the outside plating for half the vessel's length amidships, or in lieu thereof one strake of plating at the bilge, doubled for the same length.

64. **Plating No. 10,450 and under 15,500.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

65. To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths of the vessel's length amidships.

66. To have a side intercostal keelson attached to the outside plating extending as far forward and aft as practicable.

67. And to have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof to have one strake of plating at the bilge doubled for one-half the vessel's length amidships.

68. **Plating No. 15,500 and under 18,700.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the length of the vessel amidships.

69. To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

70. To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof one strake of plating at the bilge to be doubled for the same length.

71. **Plating No. 18 700 and under 26,000.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships, and the upper deck stringer plate increased two-sixteenths of an inch in thickness for one-half the vessel's length amidships.

72. To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for two-thirds of the vessel's length amidships.

73. Also to have a bulb plate, of the same size as the above, fitted to the side intercostal keelson for one-half the vessel's length amidships.

74. To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

75. And the middle line keelson in these vessels to be one-fourth deeper than required by Table G 2 for half the length amidships, tapered forward and aft to the depth given in the Table.

76. **Plating No. 26,000 and under 35,000.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships; the strake next below it to be increased two-sixteenths of an inch for half the length, and the upper deck stringer plate to be increased two-sixteenths of an inch for three-fifths the vessel's length amidships.

77. To have a continuous plate keelson standing on the floors, and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be in depth sufficient to take the deep flanges of the double angle irons on top and bottom, and to be the same thickness as that given in Table G 2 for middle line keelsons, and to extend for one-half the vessel's length amidships.

78. To have an intercostal plate fitted and riveted between the bilge keelson angle irons, and attached to the outside plating for three-fifths the vessel's length amidships, with a bulb plate, of the size given above, attached thereto, and extending two-thirds the length of the vessel amidships.

79. To have an intercostal plate riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

80. The middle line keelson to be one-fourth deeper than required by Table G 2, for one-half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

81. **Plating number 35,000 and under 40,000.** The sheerstrake and the strake below it to be doubled their whole breadth, with plates of the thickness of the topside plating for three-fourths and one-half the vessel's length amidships, and the upper deck stringer plate doubled for a breadth of forty-two inches for three-fifths the vessel's length amidships.

82. To have a continuous plate keelson standing on the floors and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth given in Table G 2 for middle line keelsons, and the same thickness, and to extend for one-half the vessel's length amidships.

83. To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length amidships, with a continuous plate keelson standing on the floors, and attached to the intercostal plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be in depth sufficient to take the double angle irons on top and bottom, and to be the same thickness as that given in Table G 2 for middle line keelsons, and to extend for one-half the vessel's length amidships.

84. To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

85. The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2, for half the length amidships, tapered forward and aft to the depth given in the Table.

VESSELS ABOVE 15 AND NOT EXCEEDING 16 DEPTHS IN LENGTH.

86. **Plating No. under 15,500.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty inches broad and of the thickness of the strake next below it, for three-fourths of the vessel's length amidships.

87. To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths the vessel's length amidships.

88. To have a side intercostal keelson attached to the outside plating, extending as far forward and aft as practicable.

89. To have intercostal plates fitted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships, or in lieu thereof to have one strake of bilge plating doubled for one-half the length amidships.

90. **Plating No. 15,500 and under 18,700.** The sheerstrake to be doubled its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the length of the vessel amidships.

91. To have, in addition to the side intercostal keelson, intercostal plates fitted between the bilge keelson angle irons, and attached to the outside plating for three-fifths the vessel's length amidships.

92. To have also intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof one strake of plating at the bilge, to be doubled for the same length.

93. **Plating No. 18,700 and under 26,000.** The sheerstrake to be doubled its whole breadth with plates of the thickness of the topside plating, for three-fourths the vessel's length amidships, and the upper deck stringer plate increased two-sixteenths of an inch in thickness for one-half the vessel's length amidships.

94. To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

95. To have intercostal plates fitted and riveted between the bilge keelson angle irons, and attached to the outside plating for half the vessel's length amidships, with a bulb plate of the size given above attached thereto, and extending three-fifths the length of the vessel amidships.

96. To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

97. The middle line keelson to be one-fourth deeper than required by Table G 2, for half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

98. **Plating No. 26,000 and under 35,000.** The sheerstrake to be doubled its whole breadth with plates of the thickness of the topside plating for three-fourths the vessel's length amidships; and the strake of plating next below it doubled its whole breadth with plates of the same thickness for three-fifths the length amidships, and the upper deck stringer plate doubled for a breadth of forty inches with plates of its own thickness for half the vessel's length amidship.

99. To have a continuous plate keelson standing on the floors, and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth given in

Table G 2 for middle line keelsons, and the same thickness, and to extend for one-half the vessel's length amidships.

100. To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length amidships, with a bulb plate of the size given above attached thereto for two-thirds the vessel's length amidships.

101. To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

102. The middle line keelson to be one-fourth deeper than required by Table G 2, for half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

103. **Plating No. 35,000 and under 40,000.*** The sheerstrake and two strakes below it to be doubled with plates of the thickness of the topside plating for three-fourths, three-fifths, and one-half the vessel's length amidships respectively; and the upper deck stringer plate to be doubled a breadth of fifty inches with plates of its own thickness for three-fifths the vessel's length amidships.

104. To have a continuous plate keelson standing on the floors and attached to the side intercostal keelson plates, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth given in Table G 2 for middle line keelsons, and the same thickness, and to extend for one-half the vessel's length amidships.

105. To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length, with a continuous plate keelson, standing on the floors and attached to the intercostal, having double angle irons on its upper and lower edges, of the size given in table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth and the same thickness as given in Table G 2 for middle line keelsons, and to extend for one half the vessel's length amidships.

106. To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

107. The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2, for half the vessel's length amidships, tapered forward and aft to the depth given on the Table.

108. For all **VESSELS EXCEEDING SIXTEEN DEPTHS IN LENGTH** to the Middle Deck and Vessels, the Plating No. of which is above 20,000 and which exceed thirteen depths in length to the Upper Deck, plans must be submitted for the approval of the Committee for giving the vessel sufficient additional strength longitudinally.

VESSLS NOT BUILT UNDER SURVEY.

Section 47. 1. In cases of vessels not surveyed while building, for which a character may be required, application must be made to the Committee in writing, who will direct a special examination to be made by two Surveyors of the Society (one of whom shall be an exclusive officer), for which purpose the vessel is to be placed on high blocks in a dry dock or on ways; the hold to be cleared and proper stages made; the rivets and plating of keel, and flat of bottom, thoroughly examined; the close

* All vessels, excepting those with an awning deck, whose plating No. exceeds 35,000 and exceeding 16 depths in length taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-deck vessels they are all to extend to the main deck.

ceiling in the hold to be removed where deemed necessary, and coal bunkers of steam vessels to be cleared; the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating exposed to view;* all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; and the planksheers and waterways, if of wood, to be scraped bright. When the vessel is so prepared, the Surveyors are to ascertain by drilling the thickness of the plating in such parts as they may deem necessary, also the condition of all the parts of iron above named, and of the planksheers, waterways, flat of decks, and their fastenings; and send a detailed report thereon, stating the dimensions and quality of the materials and workmanship, to the Committee, who will then assign the vessel such character as the facts may appear to them to warrant.

2. In addition to the above, the Special Surveys Nos. 1, 2, and 3 described on pages 18, 19, 76 & 77 of the Rules must be complied with, regulated by the age of the vessel, as in the case of vessels built under survey, and the periodical surveys are also to be held as in the case of vessels built under survey.

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 48. 1. In vessels propelled by steam the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam, by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them, in the manner and form No. 8 annexed. The Committee will thereupon, if found satisfactory, grant a certificate and insert in the Register Book the notification, "*L.M.C.*" in red (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS.

2. On the different parts of the engines during erection.
3. On the sea connections while being fitted to the vessel.
4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c., while being fitted.
5. Testing the boilers by hydraulic pressure.
6. When engines and boilers are being fixed on board the vessel.
7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

* In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected, and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with, provided that upon the removal of a portion, the plating, frames, and rivets under it be found in satisfactory condition.

9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠L.M.C." or "✠N.E.&B.," or "✠N.B."

10. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined and from them the working pressure fixed.

11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 45.)

14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

15. The boilers, together with the machinery, to be inspected at different stages of construction.

16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

17. Two safety valves to be fitted to each boiler, and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lbs. per square inch, the safety valves may be loaded to 5lbs. above the working pressure. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

18. An approved safety valve also to be fitted to the super-heater.

19. In Winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

20. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop-valves to be fitted so that each boiler can be worked separately.

22. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

23. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside plating.

24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

STEEL BOILERS.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*See* Circular, No. 438*) :—

1. The material of stays and of plates not exceeding 1 inch in thickness is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red, and quenched in water of 82° Fahrenheit.

2. Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test they must be capable of withstanding the same tests as the plates are required to undergo.
3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.
4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.
5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.
6. No steel stays are to be welded.
7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed-pumps, each capable of supplying the boilers; the pumps, &c., to be so arranged that either can be overhauled whilst the other is at work.

27. The engines are to be fitted with two bilge-pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed-pump and one bilge-pump will be deemed sufficient, provided they are of adequate capacity.

29. A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

30. The engine bilge-pumps are to be fitted capable of pumping from each compartment of the vessel. (See Section 38.) The mud boxes and roses in engine room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water. This pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room, it must be fitted to be worked by hand.

32. All steam and feed pipes are to be of copper, and of a thickness to the satisfaction of the Surveyor.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

33. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted on the plating of the vessel in an accessible position.

34. No pipes to be carried through the bunkers without being properly protected.

35. Bilge suction-pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough turned and finished.

Cast-steel shafts to be subjected to the following tests, viz. :—

A tensile test to be made to show that the material has not a greater tenacity than 30 tons per square inch, and a test piece to be cut from the casting which will permit of being bent cold through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.

37. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, *see* the formula in paragraph 46.

COCKS, PIPES, AND SEA CONNECTIONS.

38. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers* :—

39. All sea-cocks to be fitted on the plating of the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

40. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

41. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through the plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

42. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

43. The arrangements of pumps, bilge injections, suction and delivery pipes, to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

SPARE GEAR.

44. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod top-end bolts and nuts	1 set of piston springs (where common springs are used)
2 connecting rod bottom-end bolts and nuts	A quantity of assorted bolts and nuts
2 main bearing bolts	Iron of various sizes
1 set of coupling bolts	
1 set of feed and bilge pump valves	

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft	Circulating pump rod
Propeller shaft	H. P. valve spindle
Propeller, or a full set of blades	L. P. valve spindle
Stern bush, or lignum vitæ lining for bush	1 set of check valves
Air pump rod	1 pair of connecting rod brasses
1 pair of cross head brasses	6 cylinder cover bolts
1 set of link brasses	4 valve chest cover bolts
1 cylinder escape valve and spring	2 dozen boiler tubes
1 eccentric strip complete	3 dozen condenser tubes
6 junk ring bolts	1 set of safety valve springs

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS.

45. The strength of circular shells to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where **C** = co-efficient as per following table.

T = thickness of plate in inches.

D = mean diameter of shell in inches.

B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$$B = \frac{n \times a}{p \times T} \times 90 \text{ with iron rivets in iron plates with drilled holes}$$

$$B = \frac{n \times a}{p \times T} \times 85 \text{ with steel rivets in steel plates.}$$

$$B = \frac{n \times a}{p \times T} \times 70 \text{ with iron rivets in steel plates.}$$

(In case of rivets being in double shear, 1.75a is to be used instead of a.)

where **p** = pitch of rivets.

d = diameter of rivets.

a = sectional area of rivets.

n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$ -inch thick and under.	For Plates $\frac{3}{4}$ -thick and above $\frac{1}{2}$ -inch.	For Plates above $\frac{3}{4}$ -inch thick.	
Lap Joint, Punched Holes	155	165	170	
Lap Joint, Drilled Holes	170	180	190	
Double Butt Strap Joint, Punched Holes	170	180	190	
Double Butt Strap Joint, Drilled Holes	180	190	200	

STEEL BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{3}{8}$ -thick and under.	For Plates $\frac{7}{16}$ thick and above $\frac{3}{8}$.	For Plates $\frac{1}{2}$ -thick and above $\frac{7}{16}$.	For Plates above $\frac{1}{2}$ -thick.
Lap Joints.....	200	215	230	240
Double Butt Strap Joints.....	215	230	250	260

Note.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the above tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise stiffened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the weakest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely:—

Iron Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, and for all stays which are welded, 6,000 lb. per square inch; for unwelded stays above $1\frac{1}{2}$ inches effective diameter, 7,500 lb. per square inch.

Steel Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, 8,000 lb. per square inch; for stays above $1\frac{1}{2}$ inches effective diameter, 9,000 lb. per square inch. No steel stays are to be welded.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula:—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch.}$$

where T = thickness of plate in sixteenths of an inch.

P = greatest pitch in inches.

C = 90 for plates $\frac{7}{16}$ thick and under fitted with screw stays with riveted heads.

C = 100 for plates above $\frac{7}{16}$ fitted with screw stays with riveted heads.

C = 110 for plates $\frac{7}{16}$ thick and under fitted with screw stays and nuts.

C = 120 for plates above $\frac{7}{16}$ fitted with screw stays and nuts.

C = 140 for plates fitted with stays with double nuts.

C = 160 for plates fitted with stays with double nuts, and washers at least $\frac{1}{2}$ thickness of plates and a diameter of $\frac{2}{3}$ of the pitch, riveted to the plates.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L-P) \times D \times L} = \text{working pressure in lbs. per square inch.}$$

where L = length of girder.

P = pitch of stays.

D = distance apart of girders.

d = depth of girder at centre.

T = thickness of girder at centre. All these dimensions to be taken in inches.

$$C = \begin{cases} 6,000, & \text{if there is one stay to each girder.} \\ 9,000, & \text{if there are two or three stays to each girder.} \\ 10,200, & \text{if there are four stays to each girder.} \end{cases}$$

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89,600 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch.}$$

where 89,600 = constant.

T = thickness of plates in inches.

D = outside diameter of furnace in inches.

L = length of furnace in feet. If rings are fitted, the length between rings to be taken.

The pressure in no case to exceed $\frac{8,000 \times T}{D}$

The strength of the ribbed furnaces (with ribs 9 inches apart), and corrugated furnaces (corrugations $1\frac{1}{2}$ inches deep), to be calculated from the following formula :—

$$\frac{1000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch,}$$

where T = thickness of plates in sixteenths of an inch,

D = (for ribbed furnaces) outside diameter of plain part.

D = (for corrugated furnaces) greatest diameter of furnace in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests:—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULE FOR DETERMINING SIZES OF SHAFTS.

46. The diameters of crank and straight shafts are to be not less than those given by the following formula:—

$$d = \sqrt[3]{\frac{P S D^2}{C}}$$

in which

- d = Diameter of shaft in inches.
- P = Absolute pressure in lbs. per sq. inch.
- S = Stroke in inches.
- D = Diameter of Low Pressure Cylinder in inches.
- C = Constant according to the following table.

	For Crank and Propeller Shafts.	For Intermediate Shafting.
Double Expansion Engines ...	10,800	12,300
Triple Expansion Engines ...	18,800	21,200
Quadruple Expansion Engines	20,800	23,500

PERIODICAL SURVEYS OF MACHINERY. ENGINES AND BOILERS. (See N.B. at foot.)

47. The machinery and boilers of all steam ships are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey every four years upon the occasion of the vessels undergoing the Special periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules.

48. At these Special Surveys the propeller, stern-bush, and fastenings of the sea connections are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyors, the stern shaft is to be drawn and examined at least once in four years, and more frequently if deemed necessary by the Surveyors.

49. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

50. The sea connections and arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

51. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

52. The safety valves are to be examined and set to the safe working pressure.

53. If satisfactory, these Surveys will be recorded in the Register Book thus:—"LMC. 5,88" *in red*; or "B&MS. 5,88" *in red*.

54. "LMC." (LLOYD'S MACHINERY CERTIFICATE), with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

55. "B&MS." (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

56. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

57. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

58. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

59. The safety valves are to be examined and set to the safe working pressure.

60. If satisfactory, these surveys will be recorded in the Register Book thus: "B.S.5,88" *in red*.

61. "B.S." (Boilers Surveyed), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

62. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

63. In ships navigated by steam, the engines and boilers are to be considered as part of the equipment. (See Section 39, paragraphs 8 and 10.)

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

IRON SHIPS.

CLASSED UNDER REGULATIONS PREVIOUSLY PASSED FOR THE BUILDING AND CLASSIFICATION OF IRON SHIPS.

All vessels will be classed **A** so long as on careful annual and periodical *special* surveys they are found to be in a fit and efficient condition to carry dry and perishable cargoes to and from all parts of the world. (See N.B. at foot.)

Differences of construction, as regard thickness of plating, strength, and probable durability, &c. will be indicated by the letters A, B, and C placed inside the letter **A**,—thus, **A** **B** **A**.

A **B** will denote that the vessels have been built in accordance with, or equal to, the Rules and Table G.

A will denote vessels which are considered entitled to the **A** character, but which have not been built in accordance with the Rules.

All vessels to be subject to occasional or annual survey when practicable.

To entitle IRON AND STEEL VESSELS to retain the Characters assigned to them in the Register Book, they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3 respectively.

The periods at which these surveys are intended to be held, in the case of vessels classed **A** or **B**, are when a vessel is 4 years, 8 years, and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching; but when the first entry survey is not completed within that period, then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 Survey.

Similarly, vessels classed **A** must be subjected to a special survey every *three* years, as per Nos. 1, 2, and 3, and afterwards as per Nos. 1, 2, and 3 consecutively.

In any case in which it may suit the convenience of the Owners, the special surveys, Nos. 1 and 2, may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special Surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

N.B.—In order to prevent the disappointment arising from ships losing their characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due, before leaving the United Kingdom, the word "*Expired*" will be inserted against her character in the Register Book; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

Vessels which have undergone either of the foregoing examinations will be noted in the Register Book, thus: *s.s.No. 1—85, s.s.No. 2—85, s.s.No. 3—85*, indicating the special survey and date thereof.

At each of these Special Surveys of vessels propelled by steam, the machinery and boilers are to be examined by the Engineer-Surveyors, and reported upon to the Committee as to their safety and efficiency.

Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them may, at the request of the Owners, be surveyed in anticipation of the Rules; and whenever the bottom plating is to be cemented a survey is to be held prior to the cement being laid.

***Survey No. 1.**—The vessel to be placed on blocks of sufficient height in a dry dock, or on ways; the limber boards, and ceiling equal to one strake fore and aft on each side removed,† and both surfaces of outside plating exposed.‡

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom, and the tanks tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted, their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

Upper decks must be renewed when reduced in thickness as follows, viz:—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

Note.—At the Special Survey No. 1 succeeding No. 3, the chain cables are to be ranged for inspection, and the coal bunkers cleared for examination.

In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. For periodical Surveys of engines and boilers, see page 74.

***Survey No. 2.**—The vessel is to be placed on blocks of sufficient height in a dry dock, or on ways; the limber boards, and ceiling equal to three strakes fore and aft on each side removed, † and both surfaces of outside plating exposed, ‡

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

The windlass at this and all subsequent alternate special surveys to be unhung where necessary, and its wood linings sufficiently stripped for examination. The chain cables are also to be ranged for inspection at this and all subsequent special surveys.

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom, and the tanks be tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2 when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

In addition to other parts required to be examined, the coal bunkers of steam vessels must be cleared for examination.

Upper decks must be renewed when reduced in thickness as follows, viz. :—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. (See page 74.)

***Survey No. 3.**—TO BE HELD BY TWO SURVEYORS, ONE TO BE AN OFFICER OF THE SOCIETY.—The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways; proper stages to be made, and the hold to be cleared; all the close ceiling in the hold to be removed, so that the rivets, plates of keel, and flat of bottom may be thoroughly examined; coal bunkers of steam vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating, to be exposed, and where side lights are fitted, the condition of the plating in way of the same to be ascertained. All oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; the planksheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors, if they deem necessary, are to ascertain the thickness of the plating by having holes drilled.†

Such parts as may be found defective, or materially less than the required substance by Rule, are to be removed, and replaced with proper materials, equal in substance and quality to the original construction.‡ The planksheers, waterways, flat of decks, and their fastenings, are also to be examined, and made good where necessary.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

‡ Where the deterioration in thickness is widespread, and it is not deemed advisable by the Owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

In all vessels the masts, spars, and general equipment must be in good and efficient condition.

If the vessel has a double bottom, all loose ceiling must be removed therefrom, and the tanks tested by a head of water to the height of the light water-line to test their efficiency. Where deep water ballast tanks are fitted, their watertightness should be tested by a head of water not less than eight feet above the crown of the tank.

Upper decks must be renewed when reduced in thickness as follows, viz. :—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

In addition to other parts required to be examined, the coal bunkers of steam vessels must be cleared for examination.

The chain cables are to be ranged for inspection.

In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. (See page 74.)

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

2nd July, 1888.

For Ships built of Steel see pages 80 and 82.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

IRON SHIPS.

With reference to notice No. 248, announcing the Committee's Resolution of the 6th January, to allow in the case of Iron Ships (not being Spar-decked Ships) built in conformity with the Rules in other respects for the Δ Class, *a reduction of one-sixteenth of an inch* in the thickness of outside plating for all parts from that heretofore prescribed in Table G attached to the Rules, and that Iron Ships which had been built upon the Rules hitherto in force, and classed Δ , should be distinguished in the Register Book by an asterisk prefixed, thus * Δ .

NOTICE is hereby given, that in pursuance of a Resolution passed by the Committee this day, Ships only which may be built in conformity with the Rules for the Δ character in force prior to the 6th January 1870, will be allowed that character, and will have an asterisk prefixed, thus * Δ . All other Iron Ships will be classed in accordance with the New Rules 100 A, 90 A, 80 A, or their intermediates.

The foregoing Resolution will apply to all Iron Ships built or contracted for after this date.

By order of the Committee,

GEORGE B. SEYFANG,

Secretary.

No. 2, White Lion Court, Cornhill, London, E C

28th April, 1870.

NOTICE No. 436,* dated 19th May, 1881; amended 28th May, 1885.

See also NOTICE No. 552, following this NOTICE.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

SHIPS BUILT OF STEEL.

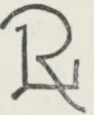
NOTICE is hereby given that the Committee of this Society have this day passed the following Resolutions, amending Notice No. 392 in regard to the classing of ships built of steel:—

1. In all cases where it is proposed to build ships of steel for classification in the Register Book, a sketch of midship section, with longitudinal and other plans showing the details of the scantlings and arrangements, must in the first place be submitted for the approval of the Committee, and the vessel, so approved, must be built under special survey.

2. A general maximum reduction of 20 per cent. in the thickness of the plating, frames, &c., of ships built of steel from that prescribed in Tables G 1, G 2, G 3, and G 4, for iron ships of the 90A grade or above will be allowed, subject to such modifications as may be deemed necessary by the Committee, according to the size of the vessel, when the plans, &c., are submitted for their approval.*

3. The steel to be used in ships building for classification in the Register Book will be required to withstand the whole of the following tests, to be applied at the steel works under the personal inspection of the Society's Surveyors, to samples selected by them from every charge or cast employed in the manufacture of the material, and these samples, when marked by them for testing, should be followed by the Surveyors through the different stages of preparation until the tests are completed.

4. The Committee will require that every plate, beam, and angle supplied for these ships shall be clearly and distinctly stamped by the manufacturer in two places, where the brand cannot be conveniently sheared off, after they have been tested, the brand to be similar to the following, thus:— denoting that a shearing from the plate or angle so marked has successfully been bent cold after being tempered as described in the temper test which follows, and that the plate or angle in question is capable of withstanding the whole of the tests hereafter described; and the Committee will require the Surveyors when in constant attendance at the steel works to satisfy themselves, so far as may be practicable, that these conditions are being complied with in a *bona fide* manner.†



5. Should the samples selected by the Surveyor not fulfil the test requirements, the plates or angles from which they were cut are to be rejected, and further tests are to be made before any material from the same charge can be accepted.

6. When one of the Society's Surveyors is not in constant attendance at the steel works for the purpose of seeing the material tested, the Committee will require that tensile and temper tests shall be applied either at the steel works or at the ship-yard to not less than one plate, angle bar, or bulb plate, in every batch of 50, or a batch of less number; but the Surveyor is not to select samples for testing until the material has been tested, stamped, and appropriated by the manufacturer. The samples

* The rivets, keel, stem, sternpost, rudder and pillars, the girders and top of double bottoms, fitted on ordinary floors, coal bunker bulkheads, casings round engines, hatchway comings, poops, forecastle and deck erections may be of iron of the usual size, but no other parts of such ships are to be of iron without the special sanction of the Committee. When other parts are admitted of iron, the same will be denoted in the Register Book.

† As required in iron ships, all plates, beams, and angles to be legibly stamped in two places with the manufacturer's name or trade-mark, and the place where made, which is also to be stated in the report of survey.

No. 436* (*continued*).

when marked by the Surveyor for testing are to be followed by him when practicable through the different stages of preparation until the tests are completed. Should the samples tested not fulfil the test requirements, the whole of the material from the charge which produced the samples which fail to withstand the tests prescribed is to be rejected, or re-tested, and further tests are to be applied to a sample from each of the other charges of which the batch is composed. In the event of any of these samples also failing, the whole of the material from the same charge or charges is to be rejected, as in the first instance.

Before these sample tests have been applied to a batch of steel submitted for check testing, the Surveyor is to be furnished with a certificate by the manufacturer to the effect that the Society's requirements as to the testing of steel have been complied with in the case of the batch in question.

7. In the event of material failing, in any case, to withstand the prescribed tests, the brands approved by the Committee and stamped on the plates, beams, and angles by the manufacturer are to be defaced by punch marks extending beyond the brand in the form of a cross, thus :—denoting that the material is rejected.



8. The Society's Surveyor will require to have every facility placed in his way for tracing all plates, beams, and angles to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, he is to sign, to be forwarded by the manufacturers to the shipbuilders, and the other of which is to be retained by himself.

TESTS.

Strips cut lengthwise or crosswise of the plate, and also angle and bulb steel, to have an ultimate tensile strength of not less than 28, and not exceeding 32 tons per square inch of section,* with an elongation equal to at least 16 per cent. on a length of 8 inches before fracture.

Strips cut from the plate, angle or bulb steel to be heated to a low cherry-red, and cooled in water of 82° Fahrenheit, must stand bending double round a curve of which the diameter is not more than three times the thickness of the plates tested.

In addition to this occasional angle bars should be subjected to a cold test by having pieces cut off and bent flat and then doubled backwards.

RIVETS.

The steel used for rivets to be of special quality, soft and ductile, and samples of the rivets should be tested by being bent both hot and cold, by flattening down the heads, and by occasional forge tests, in order to satisfy the surveyors of their thorough efficiency.

MEM.—No reduction will be allowed in the sizes of rivets from those which would be required by the Rules for the vessels if built of iron.

In other respects the rules for the construction of iron ships will apply equally to ships built of steel.

By order of the Committee,

BERNARD WAYMOUTH, *Secretary*.

No. 2, White Lion Court, Cornhill, London. E.C.

19th May, 1881, and 28th May, 1885.

* Steel angles intended for the framing of vessels, and bulb steel for beams, may have a maximum tensile strength of 33 tons per square inch of section, provided they be capable of withstanding the bending tests, and of being efficiently welded.

NOTICE, No. 552. (See NOTICE, No. 436*.)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

SHIPS BUILT OF STEEL.

NOTICE is hereby given that the Committee of this Society have this day passed the following Resolutions in regard to vessels built of steel :—

1. In vessels whose plating number does not exceed 8,000, the buttstraps of the sheerstrake, deck stringer plate, and one strake at the bilges for half the vessel's length amidships are to be $\frac{1}{20}$ th of an inch thicker than the plates they connect, and to be double riveted.

2. When the plating number is above 8,000 and not exceeding 13,000, the buttstraps of the sheerstrake, deck stringer plate, and two strakes round the bilges are to be $\frac{2}{20}$ ths of an inch thicker than the plates they connect, for half the vessel's length amidships, and treble riveted.

3. When the plating number is over 13,000 and not exceeding 16,000, an additional strake of bilge plating is to be treble riveted at the butts for half the length amidships with straps $\frac{2}{20}$ ths of an inch thicker than the plates they connect.

4. When the plating number is over 16,000 and not exceeding 20,000, in addition to the foregoing, the butts of the outside strakes of plating are to be treble riveted with straps $\frac{2}{20}$ ths of an inch thicker than the plates they connect, for half the vessel's length amidships.

5. When the plating number is above 20,000 and not exceeding 24,000, all the butts are to be treble riveted for half the vessel's length amidships with straps $\frac{3}{20}$ ths of an inch thicker than the plates they connect; and the remaining buttstraps to be $\frac{2}{20}$ ths of an inch thicker than the plates. In addition the butts of the upper deck stringer plate are to have double straps for half the length amidships.

6. When the plating number is above 24,000 and not exceeding 28,000, all the buttstraps are to be treble riveted for three-fourths the length amidships, but the outer or back row of rivets might be spaced from 5 to $5\frac{1}{4}$ diameters apart, centre to centre. The buttstraps for half the length amidships to be $\frac{2}{20}$ ths of an inch thicker than the plates; and the remaining buttstraps $\frac{2}{20}$ ths of an inch thicker than the plates.

7. When the plating number is above 28,000, the whole of the buttstraps fore and aft are to be treble riveted with the back row of rivets complete, and to be $\frac{4}{20}$ ths of an inch thicker than the plates they connect. It is recommended that in vessels of this size and exceeding 12 depths in length, double buttstraps be fitted to the sheerstrake and topside plating, or other equivalent strength supplied to the satisfaction of the Committee.

8. The rivets in the butts of outside plating and deck stringer plate to be spaced not more than $3\frac{1}{2}$ diameters apart from centre to centre.

9. In order to give a more uniform effect to the 20 per cent. reduction allowed for steel by Circular No. 436*, it has been determined that the measurements for steel may be made in 20ths of an inch, instead of 32nds, as has hitherto been the practice; the percentage reduction to be subject to such modifications as may be deemed necessary by the Committee, according to the size of the vessel, when plans, &c., are submitted for their approval.

No. 552 (*continued*).

10. The following Table indicates the thicknesses allowed for steel scantlings, compared with those required for Iron Ships as set forth in Table G 1, &c. :—

Thickness in Iron.	Thickness in Steel with 20 per cent. reduction.	Thickness in Iron.	Thickness in Steel with 20 per cent. reduction.
$\frac{16}{16}$	$\frac{16}{20}$	$\frac{10}{16}$	$\frac{10}{20}$
$\frac{15}{16}$	$\frac{15}{20}$	$\frac{9}{16}$	$\frac{9}{20}$
$\frac{14}{16}$	$\frac{14}{20}$	$\frac{8}{16}$	$\frac{8}{20}$
$\frac{13}{16}$	$\frac{13}{20}$	$\frac{7}{16}$	$\frac{7}{20}$
$\frac{12}{16}$	$\frac{12}{20}$	$\frac{6}{16}$	$\frac{6}{20}$
$\frac{11}{16}$	$\frac{11}{20}$		

11. It is to be understood that the general reduction of 20 per cent. allowed by Circular No. 436* for Steel Scantlings, is not to apply to the plating of long deck erections.

12. The stringer plates, sheerstrakes, garboard strakes, and all buttstraps when above $\frac{8}{16}$ ths in thickness, are to be carefully annealed or the holes sufficiently rirmed after punching, to remove the injurious effect of the punching.

13. The Surveyors should be careful to ensure that the black oxide or "mill-scale" is completely removed from the surfaces previous to painting, which should be delayed as long as possible.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London. E.C.

28th May, 1885, and 19th May, 1887.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE, No. 438.*

BOILERS MADE OF STEEL.

NOTICE is hereby given, that the Committee of this Society have this day passed the following resolutions amending Notice No. 397 in regard to boilers made of steel:—

1. The use of steel will be sanctioned in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, provided the boilers be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled.

2. The material is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section,* with an ultimate elongation of not less than 20 per cent. in a

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

No. 438* (*continued*).

length of eight inches. It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82° Fahrenheit.

Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented.* In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the furnaces and combustion chambers of the boilers.

4. The Society's Surveyor will attend at the steel works when necessary, and select the samples for testing before the plates are sheared to size, and these samples when marked by him for testing should, as far as practicable, be followed by the Surveyor through the different stages of preparation until the tests are completed.

5. The Society's Surveyor will require to have every facility placed in his way for tracing all plates to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, is to be signed and forwarded to the boiler manufacturer, and the other is to be retained by himself.

6. The samples are taken for testing in order that the general quality of the material may be ascertained, and if any sample should fail to fulfil the conditions laid down, the plate from which the sample is taken must be rejected; and further tests should be made before any material, made from the same cast or charge as the failing sample, can be approved.

7. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

8. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

9. No steel stays are to be welded.

10. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

By order of the Committee,
BERNARD WAYMOUTH,
Secretary.

No. 2, *White Lion Court, Cornhill, London, E.C.*
19th May, 1881.

* When a great number of charges are represented in the number of plates submitted, a proportion of one tensile and one temper test to every ten plates will be deemed sufficient, provided they all prove to be satisfactory.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	...	...	...	£1	1	0
For each succeeding visit, when more than one visit is necessary	...	...	...	0	10	6
For special surveys special charges will be made, subject to the control of the Committee.						

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an **A1*** or an **A1*** certificate; and once in every three years for vessels with an **A1** **A1**, **A** or an **A** certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Monthly Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

FIRST SURVEY.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally, and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

SECOND SURVEY.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood ; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

THIRD SURVEY.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

FOURTH SURVEY.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water line.

FIFTH SURVEY.

The vessel must be submitted to the same survey as before described for "Second Survey."

SIXTH SURVEY OR SPECIAL SURVEY.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions:—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee, she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time; and, before completing his report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an **A1*** or **A1*** certificate, ten years for vessels with an **A1** or **A1** certificate, and nine years for vessels with an **A** or **A** certificate; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an **A1*** or **A1*** certificate, twenty years for vessels with an **A1** or **A1** certificate, and eighteen years for vessels with an **A** or **A** certificate.

The symbols of class when printed within brackets thus (**A1***) — indicate that the class of the Vessel has lapsed for want of Survey, and when printed within brackets thus (**A1***) (—), that the class has been withdrawn by request of the Owners.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, E.C.
1st September, 1885.

CHAINS AND ANCHORS FOR SAILING VESSELS.

(For Steam Vessels see other side.)

TONNAGE FOR REGULATING THE SCANTLINGS & EQUIPMENT (AS REGARDS ANCHORS, CHAINS, &c.) OF WOOD & COMPOSITE VESSELS.

In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then the difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

No. 304.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHAIN CABLES.

TESTING TO BREAKING STRAIN.

"Chains tested under the Chain Cable and Anchor Act of 1864, at a Machine recognised by the Committee, will be accepted for any Vessel built, commenced, or contracted for *prior* to the 1st July, 1872; and all Vessels built, commenced, or contracted for *after* the 30th June, 1872, will be required to be supplied with Chains tested in conformity with the requirements of the New Act."

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.
1st January, 1873.

(e) STEEL WIRE TOWLINES, HAWSERS AND WARPS.

(e) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the towline, &c., will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in Table 22, and the aggregate strength of the wires must not be less than ten per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the foregoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issued by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawsers, will be supplied to them upon application to the Secretary.

20th December, 1883.

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed in the thirteenth column of the page of the Register Book to indicate the Equipment numbers of vessels per this Table.

Minimum Weights of Anchors, ex. Stock; Sizes and Lengths of Chains, and the proof strain to which they are to be tested per Chain Cables and Anchors Acts. The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

Also Sizes and Lengths of Towlines, Hawsers and Warps.

NUMBERS FOR IRON Vessels, See Foot Note. (a)		SHIP'S TONNAGE. Tons.	ANCHORS. (c)												STUD-CHAIN CABLES. (c) (d)				SHIP'S TONNAGE.	NUMBERS FOR IRON VESSELS. See Foot Note. (a)	STREAM, CHAIN OR STEEL WIRE.				TOWLINE: HEMP OR STEEL WIRE (e)				HAWSERS AND WARPS. 90 fathms of each						
			Number.			Bowers (b)		Collective		Weight.		Ex. Stock.				Minimum Size.	Proved to Admiralty Test.	Breaking Test.			Length.	CHAIN. (c)		STEEL WIRE.		HEMP.		STEEL WIRE.							
			Bowers.	Stream.	Kedges.	Ex. Stock.	Test. *	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.							2nd Kds.	Test. #	F'thms	Inch.	Inch.	Tons.	F'thms	Inch.	Inch.	Tons.	F'thms	Inch.	Inch.	Tons.
a	1900	50	2	1	1	3½	5½	7	¾	—	½	—	—	—	1½	8½	12¾	120	50	a	1900	45	1½	—	75	5	—	3	—						
b	2500	75	2	1	1	4½	6½	8½	1½	—	½	—	—	—	1½	10½	15½	120	75	b	2500	45	1½	—	75	5½	—	3	—						
c	3100	100	2	1	1	5	7½	10	1½	3½	¾	—	—	—	1½	11½	17½	135	100	c	3100	45	1½	—	75	5½	—	3	—						
d	3650	125	2	1	1	5½	8	11½	1½	3½	¾	—	—	—	1½	13½	20½	165	125	d	3650	45	1½	—	75	6	—	3½	—						
e	4200	150	2	1	1	6½	8½	13	2	4½	1	—	—	—	1½	15½	23½	165	150	e	4200	45	1½	2	7	75	6½	4	—						
f	4700	175	2	1	1	7½	9½	14½	2½	4½	1	—	—	—	1½	18	27	165	175	f	4700	45	1½	2	7	75	6½	4	—						
g	5150	200	3	1	1	8½	10½	23½	2½	5	1½	—	—	—	1½	20½	30½	165	200	g	5150	45	1½	2½	9½	75	7	4	—						
h	6000	250	3	1	2	10	12	28½	3¾	6½	1¾	4½	¾	—	1½	22½	34½	195	250	h	6000	45	1½	2½	9½	75	7½	5	—						
i	6800	300	3	1	2	12	13½	34½	4	6½	2	4½	1	—	1½	25½	38	195	300	i	6800	60	1½	2¾	15½	75	8	5½	—						
j	7550	350	3	1	2	13½	15½	38½	4¾	7½	2½	5	1½	—	1½	28½	42½	210	350	j	7550	60	1½	2¾	15½	75	8	5½	—						
k	8250	400	3	1	2	15½	16½	43½	5½	7½	2½	5	1½	3½	1½	31	46½	210	400	k	8250	60	1½	2¾	15½	75	8½	6	—						
l	8900	450	3	1	2	16½	18	47½	5½	7½	2¾	5½	1½	3½	1½	34	51	240	450	l	8900	60	1½	2¾	15½	75	9	6½	—						
m	9600	500	3	1	2	18	19	51½	6½	8½	3½	5½	1½	3½	1½	37½	55½	240	500	m	9600	60	1½	3	18	75	9½	7	—						
n	10800	600	3	1	2	21	21½	60	7½	9½	3½	5½	1½	4½	1½	40½	58½	240	600	n	10800	60	1½	3	18	90	10	7	4						
o	12000	700	3	1	2	23½	23½	67	8	10½	4	6½	2	4½	1½	43½	61½	270	700	o	12000	60	1½	3½	22	90	10	8	5						
p	13200	800	3	1	2	25½	25½	72½	8½	10½	4½	6½	2½	4½	1½	47½	66½	270	800	p	13200	75	1½	3½	22	90	10	8	5						
q	14400	900	3	1	2	27½	26½	79	8¾	10½	4½	6½	2½	4½	1½	51½	71½	270	900	q	14400	75	1½	3½	26	90	10½	9	5½						
r	15500	1000	3	1	2	30	28½	85½	9½	11½	4¾	7½	2½	5	1½	55½	77½	270	1000	r	15500	75	1½	3½	26	90	10½	9	5½						
s	17600	1200	3	1	2	32	30½	91½	10½	12½	5½	7½	2½	5	1½	59½	82½	270	1200	s	17600	75	1	3¾	29	90	11	9½	6						
t	19600	1400	3	1	2	34	31½	97	10¾	12½	5½	7½	2½	5	1½	63½	88½	270	1400	t	19600	75	1	3¾	29	90	11	10	6						
u	21600	1600	3	1	2	36½	33½	104	11½	13½	5½	7½	2½	5½	1½	67½	94½	270	1600	u	21600	75	1½	4	33	90	11	10½	6½						
v	23400	1800	3	1	2	38	34½	108½	11½	13½	5½	8	2½	5½	2	72	100½	270	1800	v	23400	75	1½	4	33	90	12	11	7						
w	25100	2000	3	1	2	40	35½	114	12	13½	6	8½	3	5½	2½	76½	107½	270	2000	w	25100	100	1½	4½	35	90	12	11	7						
x	29400	2500	3	1	2	42	37½	119½	13½	15½	6¾	9	3½	5½	2½	86½	120½	300	2500	x	29400	120	1½	4½	35	90	13	12	8						
y	33400	3000	3	1	2	45	39½	128½	15½	16½	7½	9½	3½	6½	2½	96½	134½	300	3000	y	33400	120	1½	4½	39	90	13	12	8						

(a) By Section 39 of the Rules for the Building and Classification of Iron Ships, it is provided that "The equipment is to be regulated by the Number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, her depth from the upper part of keel to the top of the upper-deck beams and the girth of her half midship section to the same height, multiplied by her length, for a one, two, and three-decked vessel, and for a spar-decked vessel."

For a vessel with a poop, topgallant forecastle, or a raised quarter-deck, the equipment number to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, 7th June, 1888.

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under:—
Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in the Table, but in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.

All Anchor Stocks must be of acknowledged and approved description, and to be one-fourth the weight of the anchor given in the Table.
Stockless Anchors.—In the case of Stockless Anchors, an addition to the weight specified in this Table must be made of one fourth to compensate for the deficiency in weight consequent on the absence of stock.

* The tests of Anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

(c) All Anchors, including Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(c) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(d) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains, for the tensile strain, and 100 per cent. above the tensile strain for the breaking strain.

(e) When steel wire Towlines or Hawsers are adopted, see note e at side of Table.

Where a departure from the requirements of the Table for Hawsers and Warps is proposed, the same should be in all cases submitted in the first place for the approval of the Committee.

TONNAGE FOR REGULATING THE SCANTLINGS & EQUIPMENT (AS REGARDS ANCHORS, CHAINS, &c.) OF WOOD & COMPOSITE VESSELS.

In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

In vessels having a *raised quarter deck*, or a poop, or top-gallant fore-castle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then the difference between the tonnage of these erections and the tonnage of the space allowed for crew is to be added to the register tonnage*, cut on the main beam, for the tonnage that is to regulate the equipment.

No. 304.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.**CHAIN CABLES.****TESTING TO BREAKING STRAIN.**

"Chains tested under the Chain Cable and Anchor Act of 1864, at a Machine recognised by the Committee, will be accepted for any Vessel built, commenced, or contracted for *prior to the 1st July, 1872*; and all Vessels built, commenced, or contracted for *after the 30th June, 1872*, will be required to be supplied with Chains tested in conformity with the requirements of the New Act."

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.
1st January, 1873.**(e) STEEL WIRE TOWLINES, HAWSERS AND WARPS.**

(e) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the towline, &c., will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in Table 22, and the aggregate strength of the wires must not be less than ten per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the foregoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issued by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawsers, will be supplied to them upon application to the Secretary.

20th December, 1883.

(a) By Section 39 of the Rules for the Building and Classification of Iron Ships, it is provided that "The equipment is to be regulated by the Number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, her depth from the upper part of keel to the top of the upper-deck beams and the girth of her half midship section to the same height, multiplied by her length, for a one, two, and three-decked vessel, and for a spar-decked vessel."

For a vessel with a poop, topgallant fore-castle, or a raised quarter-deck, the equipment number to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, 7th June, 1888.

No. 22.

CHAINS AND ANCHORS FOR SAILING VESSELS.

Minimum Weights of Anchors, ex. Stock; Sizes and Lengths of Chains, and the proof strain to which they are to be tested per Chain Cables and Anchors Acts. The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

Also Sizes and Lengths of Towlines, Hawsers and Warps.

(For Steam Vessels see other side.)

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed on page of the Register Book to indicate the Equipment numbers of vessels per this Table.

NUMBERS FOR IRON VESSELS. See Foot Note. (a)	SHIP'S TONNAGE. Tons.	ANCHORS. (c)												STUD-CHAIN CABLE. (e) (d)				SHIP'S TONNAGE.	NUMBERS FOR IRON VESSELS. See Foot Note. (a)	STREAM, CHAIN OR STEEL WIRE.				TOWLINE: HEMP OR STEEL WIRE (e)				HAWSERS AND WARPS.						
		Number.			Bowers (b)		Collective Weights.	Weight.						Minimum Size.	Proved to Admiralty Test.	Breaking Test.	Length.			CHAIN. (c)			STEEL WIRE.		HEMP.		STEEL WIRE.		90 fathms of each					
		Bowers.	Stream.	Kedges.	Ex. Stock.	Test. #		Stream.	Test. #	Kedge	Test. #	2nd Kdg	Test. #							Size.	Tons.	Tons.	Fathoms.	F'thms	Inch.	Inch.	Tons.	F'thms		Inch.	Inch.	Tons.	Inch.	Inch.
a 1900	50	2	1	1	3½	5½	7	¾	—	½	—	—	—	—	—	1½	8½	12½	120	50	a 1900	45	1½	—	75	5	—	3	—					
b 2500	75	2	1	1	4½	6½	8½	1½	—	½	—	—	—	—	—	1½	10½	15½	120	75	b 2500	45	1½	—	75	5½	—	3	—					
c 3100	100	2	1	1	5	7½	10	1½	3½	¾	—	—	—	—	—	1½	11½	17½	135	100	c 3100	45	1½	—	75	5½	—	3	—					
d 3650	125	2	1	1	5½	8	11½	1½	3½	¾	—	—	—	—	—	1½	13½	20½	165	125	d 3650	45	1½	—	75	6	—	3½	—					
e 4200	150	2	1	1	6½	8½	13	2	4½	1	—	—	—	—	—	1½	15½	23½	165	150	e 4200	45	1½	2	7	6½	—	4	—					
f 4700	175	2	1	1	7½	9½	14½	2½	4½	1	—	—	—	—	—	1	18	27	165	175	f 4700	45	1½	2	7	6½	—	4	—					
g 5150	200	3	1	1	8½	10½	23½	2½	5	1½	—	—	—	—	—	1½	20½	30½	165	200	g 5150	45	1½	2½	9½	75	7	4	—					
h 6000	250	3	1	2	10	12	28½	3½	6½	1½	4½	¾	—	—	—	1½	22½	34½	195	250	h 6000	45	1½	2½	9½	75	7½	5	—					
i 6800	300	3	1	2	12	13½	34½	4	6½	2	4½	1	—	—	—	1½	25½	38	195	300	i 6800	60	1½	2½	15½	75	8	5½	—					
j 7550	350	3	1	2	13½	15½	38½	4½	7½	2½	5	1½	—	—	—	1½	28½	42½	210	350	j 7550	60	1½	2½	15½	75	8	5½	—					
k 8250	400	3	1	2	15½	16½	43½	5½	7½	2½	5	1½	3½	—	—	1½	31	46½	210	400	k 8250	60	1½	2½	15½	75	8½	6	—					
l 8900	450	3	1	2	16½	18	47½	5½	7½	2½	5	1½	3½	—	—	1½	34	51	240	450	l 8900	60	1½	2½	15½	75	9	6½	—					
m 9600	500	3	1	2	18	19	51½	6½	8½	3½	5½	1½	3½	—	—	1½	37½	55½	240	500	m 9600	60	1½	3	18	75	9½	7	—					
n 10800	600	3	1	2	21	21½	60	7½	9½	3½	5½	1½	4½	—	—	1½	40½	58½	240	600	n 10800	60	1½	3	18	90	10	7	4					
o 12000	700	3	1	2	23½	23½	67	8	10½	4	6½	2	4½	—	—	1½	43½	61½	270	700	o 12000	60	1½	3½	22	90	10	8	5					
p 13200	800	3	1	2	25½	25½	72½	8½	10½	4½	6½	2½	4½	—	—	1½	47½	66½	270	800	p 13200	75	1½	3½	22	90	10	8	5					
q 14400	900	3	1	2	27½	26½	79	8½	10½	4½	6½	2½	4½	—	—	1½	51½	71½	270	900	q 14400	75	1½	3½	26	90	10½	9	5½					
r 15500	1000	3	1	2	30	28½	85½	9½	11½	4½	7½	2½	5	—	—	1½	55½	77½	270	1000	r 15500	75	1½	3½	26	90	10½	9	5½					
s 17600	1200	3	1	2	32	30½	91½	10½	12½	5½	7½	2½	5	—	—	1½	59½	82½	270	1200	s 17600	75	1	3½	29	90	11	9½	6					
t 19600	1400	3	1	2	34	31½	97	10½	12½	5½	7½	2½	5	—	—	1½	63½	88½	270	1400	t 19600	75	1	3½	29	90	11	10	6					
u 21600	1600	3	1	2	36½	33½	104	11½	13½	5½	7½	2½	5½	—	—	1½	67½	94½	270	1600	u 21600	75	1½	4	33	90	11	10½	6½					
v 23400	1800	3	1	2	38	34½	108½	11½	13½	5½	8	2½	5½	—	—	2	72	100½	270	1800	v 23400	75	1½	4	33	90	12	11	7					
w 25100	2000	3	1	2	40	35½	114	12	13½	6	8½	3	5½	—	—	2½	76½	107½	270	2000	w 25100	100	1½	4½	35	90	12	11	7					
x 29400	2500	3	1	2	42	37½	119½	13½	15½	6½	9	3½	5½	—	—	2½	86½	120½	300	2500	x 29400	120	1½	4½	35	90	13	12	8					
y 33400	3000	3	1	2	45	39½	128½	15½	16½	7½	9½	3½	6½	—	—	2½	96½	134½	300	3000	y 33400	120	1½	4½	39	90	13	12	8					

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under:— Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in the Table, but in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.

All Anchor Stocks must be of acknowledged and approved description, and to be one-fourth the weight of the anchor given in the Table. Stockless Anchors.—In the case of Stockless Anchors, an addition to the weight specified in this Table must be made of one fourth to compensate for the deficiency in weight consequent on the absence of stock.

* The tests of Anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

(c) All Anchors, including Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(e) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(d) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains, for the *tensile* strain, and 100 per cent. above the *tensile* strain for the *breaking* strain.

(e) When steel wire Towlines or Hawsers are adopted, see note e at side of Table.

Where a departure from the requirements of the Table for Hawsers and Warps is proposed, the same should be in all cases submitted in the first place for the approval of the Committee.

IRON VESSELS.

TABLE G. 1.

TABLE OF MINIMUM DIMENSIONS OF KEELS, STEMS, STERN POSTS, FRAMES, REVERSED FRAMES, FLOOR PLATES, BULKHEADS, OUTSIDE PLATING, PILLARS, &c.

NUMBERS. For Frames, Reversed Frames, Bulkheads, and Pillars.	SPACING OF FRAMES.	FRAMES FOR ALL GRADES.						Diameter of solid pillars to beams.	NUMBERS. For Keel, Stem, Sternpost, and Plating.	KEEL. FOR ALL GRADES.	Stem of Sailing ves- sels and Steamers, and Stern- post of Sail- ing vessels and Paddle Steamers.	Stern-frame of Screw Steamers.	THICKNESS OF OUTSIDE PLATING FOR HALF-LENGTH AMIDSHIPS.							
		Dimensions of angle iron for three- fifths the length of vessel amidships, and bulkheads.	Dimensions of angle iron before and abaft the three-fifths length.	Dimensions of angle iron for Reversed frames for all grades.	Bulk- heads.	Hold.	Deck.						Garboard Strakes.		From Garboard to the lower edge of sheerstrake. (a)			Sheerstrake for all grades.	From main to upper sheer- strake in Spar decked vessels — all grade	
													100A	90A AND 80A	100A	90A	80A			
31.5 and 37	In Vessels where the numbers in Table G 1 are under 5200, the space of the frames from centre to centre is not to exceed 20 inches; where they are 5200, and under 8900, the space may be 21 inches; where the numbers are 8900 and under 13100, the space may be 22 inches; when 13100, and under 16600, the space may be 23 inches; and when 16600, and under 48500, it may be 24 inches; and when 48500 and above, it may be 26 inches.	inches. 2½ × 2½ × ⅝	inches. 2½ × 2½ × ⅝	inches. 2¼ × 2¼ × ⅔	inches. ⅔	—	2¼	2600 and 3400	6 × 1⅛	5½ × 1⅛	5½ × 2¼	inches. 30 × ⅙	inches. ⅙	inches. ⅝ & ⅙	inches. ⅝	inches. ⅔ & ⅝	inches. 30 × ⅙	inches.		
37 and 45		3 × 2½ × ⅝	3 × 2½ × ⅝	2½ × 2½ × ⅔	⅔	—	2½	3400 and 5200	6¾ × 1¼	6 × 1¼	6 × 2½	" × ⅗	⅙	⅙	⅝ & ⅙	⅝	" × ⅗			
45 and 52		3 × 3 × ⅙	3 × 3 × ⅝	2½ × 2½ × ⅝	⅔	2½	2⅜	5200 and 7200	7 × 1⅝	6¼ × 1⅝	6¼ × 3¼	" × ⅘	⅗	⅙	⅙ & ⅗	⅙	⅝ & ⅙	" × ⅘		
52 and 57		3½ × 3 × ⅙	3½ × 3 × ⅝	3 × 2½ × ⅝	⅝	2⅝	2⅜	7200 and 8900	7¼ × 1⅞	6½ × 1⅞	6½ × 3¾	" × ⅑	⅘	⅙	⅙ & ⅗	⅙		33 × ⅑		
57 and 61		3½ × 3 × ⅗	3½ × 3 × ⅙	3 × 2½ × ⅙	⅝	2¾	2½	8900 and 10450	7½ × 2⅛	6¾ × 2⅛	6¾ × 4¼	32 × ⅑	⅘	⅙	⅙ & ⅘	⅙	⅙ & ⅙	" × ⅒		
61 and 65		4 × 3 × ⅗	4 × 3 × ⅙	3 × 3 × ⅙	⅙	2⅞	2½	10450 and 11800	7½ × 2¼	7 × 2¼	7 × 4½	" × ⅑	⅘	⅙	⅙ & ⅘	⅙		" × ⅒		
65 and 68		4 × 3 × ⅗	4 × 3 × ⅙	3 × 3 × ⅙	⅙	3	2½	11800 and 13100	8 × 2⅜	7 × 2⅜	7 × 4¾	" × ⅒	⅑	⅙	⅙ & ⅑	⅙	⅙ & ⅙	36 × ⅒		
68 and 71		4½ × 3 × ⅗	4½ × 3 × ⅙	3 × 3 × ⅗	⅙	3⅛	2⅝	13100 and 14300	8 × 2⅜	7¼ × 2⅜	7¼ × 4¾	34 × ⅒	⅑	⅙	⅙ & ⅑	⅙		" × ⅒	⅗	
71 and 73		4½ × 3 × ⅘	4½ × 3 × ⅗	3 × 3 × ⅗	⅙	3¼	2⅝	14300 and 15500	8 × 2⅜	7½ × 2⅜	7½ × 4¾	" × ⅒	⅒	⅙	⅙ & ⅒	⅙	⅙ & ⅙	" × ⅒	⅗	
73 and 76		5 × 3 × ⅘	5 × 3 × ⅗	3 × 3 × ⅗	⅙	3⅝	2⅝	15500 and 16600	8½ × 2½	8 × 2½	8 × 5	" × ⅒	⅒	⅙	⅙ & ⅒	⅙	⅙ & ⅙	" × ⅒	⅗	
76 and 80		5 × 3 × ⅘	5 × 3 × ⅗	3½ × 3 × ⅘	⅗	3½	2¾	16600 and 18700	9 × 2½	8½ × 2½	8½ × 5	36 × ⅒	⅒	⅒	⅙ & ⅒	⅙		40 × ⅒	⅘	
80 and 85		5 × 3½ × ⅘	5 × 3½ × ⅗	3½ × 3½ × ⅘	⅗	3⅝	2¾	18700 and 21700	9½ × 2½	9 × 2½	9 × 5½	" × ⅒	⅒	⅒	⅒ & ⅒	⅒	⅙ & ⅒	" × ⅒	⅘	
85 and 92		5½ × 3½ × ⅘	5½ × 3½ × ⅗	3½ × 3½ × ⅘	⅗	3⅝	2¾	21700 and 26400	10 × 2¾	10 × 2¾	10 × 6	" × ⅒	⅒	⅒	—	—		" × ⅒	⅘	
92 and 99		5½ × 3½ × ⅑	5½ × 3½ × ⅘	4 × 3½ × ⅘	⅗	3¾	2⅞	26400 and 30900	11 × 2¾	11 × 2¾	11 × 6½	" × ⅒	⅒	⅒ & ⅒	—	—		" × ⅒	⅘	
99 and 104		6 × 3½ × ⅑	6 × 3½ × ⅘	4 × 3½ × ⅑	⅗	3¾	2⅞	30900 and 35200	11 × 3	11 × 3	11 × 7	" × ⅒	⅒	⅒	—	—		" × ⅒	⅑	
104 and 110	6 × 3½ × ⅒	6 × 3½ × ⅑	4½ × 3½ × ⅑	⅗	4	3	35200 and 40000	11 × 3¼	11 × 3¼	11 × 7½	" × ⅒	⅒	⅒ & ⅒	—	—		" × ⅒	⅑		
110 and 115	6½ × 3½ × ⅒	6½ × 3½ × ⅑	4½ × 3½ × ⅑	⅗	4¼	3	40000 and 48500	12 × 3¼	12 × 3¼	12 × 8	" × ⅒	—	⅒	—	—		" × ⅒	⅑		
115 and 120	7 × 3½ × ⅒	6½ × 3½ × ⅑	4½ × 4 × ⅑	⅗	4½	3¼	48500 and 56000	12 × 3½	12 × 3½	13 × 8½	" × ⅒	—	⅒ & ⅒	—	—		" × ⅒	⅑		
							56000 and 67000	12 × 3¾	12 × 3¾	13 × 9	" × ⅒	—	⅒	—	—		" × ⅒	⅑		

(a) In the columns for plating, where two thicknesses are given, they are to be worked in alternate strakes, and the large thickness is to apply to the outer strakes, and the smaller one to the inner strakes: and the size of the rivets and double riveting to be regulated by the thickness of the thicker plating, except where 1/8" and 1/4" outside plating is used alternately, when 3/4" of an inch rivets may be used.

TABLE FOR SIZES OF FLOORS.

See SECTION 7.

Floor plates under Engines and Boilers of Steam Vessels to be one-sixteenth of an inch thicker than given in this Table, where the plates are nine-sixteenths of an inch and under.

Floor plates under Engines and Boilers																																																Steam Vessels to be one-sixteenth of an inch thicker than given in this Table, where the plates are nine-sixteenths of an inch and under.																																															
NUMBERS FOR FLOORS.	31 and under 32	32 to 33	33 to 34	34 to 35	35 to 37	37 to 39	39 to 41	41 to 43	43 to 45	45 to 47	47 to 49	49 to 51	51 to 52	52 to 53	53 to 55	55 to 56	56 to 57	57 to 58	58 to 59	59 to 60	60 to 62	62 to 63	63 to 64	64 to 65	65 to 66	66 to 67	67 to 68	68 to 69	69 to 70	70 to 71	71 to 72	72 to 73	73 to 74	74 to 76	76 to 78	78 to 80	80 to 84	84 to 88	88 to 92	92 to 98	98 to 105	105 to 110	110 to 115	115 to 120	120 to 126	NUMBERS FOR FLOORS																																																	
Sizes.	9 x 4 16	9 1/2 x 4 16	10 x 4 16	10 1/2 x 4 16	11 x 5 16	11 1/2 x 5 16	12 x 5 16	12 x 5 16	12 1/2 x 5 16	13 x 5 16	13 1/2 x 5 16	14 x 5 16	14 1/2 x 5 16	15 x 5 16	15 1/2 x 5 16	16 x 5 16	16 1/2 x 5 16	17 x 5 16	17 1/2 x 5 16	18 x 5 16	18 1/2 x 5 16	19 x 5 16	19 1/2 x 5 16	20 x 5 16	20 1/2 x 5 16	21 x 5 16	21 x 5 16	21 1/2 x 5 16	22 x 5 16	22 1/2 x 5 16	23 x 5 16	23 1/2 x 5 16	24 x 5 16	24 x 5 16	24 1/2 x 5 16	25 x 5 16	26 x 5 16	28 x 5 16	30 x 5 16	32 x 5 16	34 x 5 16	36 x 5 16	38 x 5 16	Sizes.																																																			

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed eleven times their depth from top of keel, see Section 1. For Vessels which exceed this proportion, see Section 46. For proportions of breadth to length, see Table G. 4.

IRON VESSELS

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TABLE OF STRENGTHS OF IRON DECK

Length of Deck in Feet	Width of Deck in Feet	Thickness of Deck in Inches	Weight of Deck in Pounds per Square Foot	Strength of Deck in Tons per Square Foot
10	10	1/2	15.7	1.0
10	10	3/4	23.5	1.5
10	10	1	31.4	2.0
10	10	1 1/4	39.3	2.5
10	10	1 1/2	47.2	3.0
10	10	1 3/4	55.1	3.5
10	10	2	67.0	4.0
10	10	2 1/4	78.9	4.5
10	10	2 1/2	86.8	5.0
10	10	3	104.7	6.0
10	10	3 1/2	122.6	7.0
10	10	4	140.5	8.0
10	10	4 1/2	158.4	9.0
10	10	5	176.3	10.0
10	10	5 1/2	194.2	11.0
10	10	6	212.1	12.0
10	10	6 1/2	230.0	13.0
10	10	7	247.9	14.0
10	10	7 1/2	265.8	15.0
10	10	8	283.7	16.0
10	10	8 1/2	301.6	17.0
10	10	9	319.5	18.0
10	10	9 1/2	337.4	19.0
10	10	10	355.3	20.0
10	10	10 1/2	373.2	21.0
10	10	11	391.1	22.0
10	10	11 1/2	409.0	23.0
10	10	12	426.9	24.0
10	10	12 1/2	444.8	25.0
10	10	13	462.7	26.0
10	10	13 1/2	480.6	27.0
10	10	14	498.5	28.0
10	10	14 1/2	516.4	29.0
10	10	15	534.3	30.0
10	10	15 1/2	552.2	31.0
10	10	16	570.1	32.0
10	10	16 1/2	588.0	33.0
10	10	17	605.9	34.0
10	10	17 1/2	623.8	35.0
10	10	18	641.7	36.0
10	10	18 1/2	659.6	37.0
10	10	19	677.5	38.0
10	10	19 1/2	695.4	39.0
10	10	20	713.3	40.0
10	10	20 1/2	731.2	41.0
10	10	21	749.1	42.0
10	10	21 1/2	767.0	43.0
10	10	22	784.9	44.0
10	10	22 1/2	802.8	45.0
10	10	23	820.7	46.0
10	10	23 1/2	838.6	47.0
10	10	24	856.5	48.0
10	10	24 1/2	874.4	49.0
10	10	25	892.3	50.0
10	10	25 1/2	910.2	51.0
10	10	26	928.1	52.0
10	10	26 1/2	946.0	53.0
10	10	27	963.9	54.0
10	10	27 1/2	981.8	55.0
10	10	28	999.7	56.0
10	10	28 1/2	1017.6	57.0
10	10	29	1035.5	58.0
10	10	29 1/2	1053.4	59.0
10	10	30	1071.3	60.0
10	10	30 1/2	1089.2	61.0
10	10	31	1107.1	62.0
10	10	31 1/2	1125.0	63.0
10	10	32	1142.9	64.0
10	10	32 1/2	1160.8	65.0
10	10	33	1178.7	66.0
10	10	33 1/2	1196.6	67.0
10	10	34	1214.5	68.0
10	10	34 1/2	1232.4	69.0
10	10	35	1250.3	70.0
10	10	35 1/2	1268.2	71.0
10	10	36	1286.1	72.0
10	10	36 1/2	1304.0	73.0
10	10	37	1321.9	74.0
10	10	37 1/2	1339.8	75.0
10	10	38	1357.7	76.0
10	10	38 1/2	1375.6	77.0
10	10	39	1393.5	78.0
10	10	39 1/2	1411.4	79.0
10	10	40	1429.3	80.0
10	10	40 1/2	1447.2	81.0
10	10	41	1465.1	82.0
10	10	41 1/2	1483.0	83.0
10	10	42	1500.9	84.0
10	10	42 1/2	1518.8	85.0
10	10	43	1536.7	86.0
10	10	43 1/2	1554.6	87.0
10	10	44	1572.5	88.0
10	10	44 1/2	1590.4	89.0
10	10	45	1608.3	90.0
10	10	45 1/2	1626.2	91.0
10	10	46	1644.1	92.0
10	10	46 1/2	1662.0	93.0
10	10	47	1679.9	94.0
10	10	47 1/2	1697.8	95.0
10	10	48	1715.7	96.0
10	10	48 1/2	1733.6	97.0
10	10	49	1751.5	98.0
10	10	49 1/2	1769.4	99.0
10	10	50	1787.3	100.0

When an iron deck, if diagonal tie beams in two decked vessels. In such case the stringer plates may be used.

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IRON VESSELS.

TABLE G. 2.

TABLE OF MINIMUM DIMENSIONS OF KEELSONS, KEELSON AND STRINGER ANGLE IRONS, DECKS, RUDDERS, CEILING, AND WINDLASSES.

NUMBERS. To regulate keelsons stringers, decks, rudders, ceiling, and windlasses.	Size of middle-line keelsons standing upon floors, and thickness of rider plate to keelson for all grades.	Thickness of inter- costal keelson plates and side plates for box keel- sons, for all grades. (<i>aa</i>)	Dimensions of angle irons on upper deck beam stringer plates in one and two-decked vessels, also for keelsons, and stringers in hold, for all grades.	Dimensions of angle irons on the middle, lower or hold, and orlop beam stringer plates, on upper deck stringer plates in three-decked, spar- decked, and awning- decked vessels, also for box keelsons, for all grades.	RUDDER.				Thickness of upper deck, for all grades. (<i>a</i>) Wood.	Thick- ness of wood ceiling in hold, to upper part of bilges.	WINDLASS.				NUMBERS. To regulate keelsons, stringers, decks, rudders, ceiling, and windlasses.
					Sailing Vessels.		Steam Vessels.				Sailing Vessels.		Steam Vessels.		
					Diameter at the head.	Diameter at the heel & pintle.	Diameter at the head.	Diameter at the heel & pintle.			Diameter of iron spindle.	Diameter of main piece.	Diameter of iron spindle.	Diameter of main piece.	
2600 and under 3400	inches. $7\frac{1}{2} \times \frac{6}{16}$	inches. $\frac{4}{16}$	inches. $3 \times 3 \times \frac{6}{16}$	inches. $2\frac{3}{4} \times 2\frac{3}{4} \times \frac{6}{16}$	inches. $2\frac{7}{8}$	inches. 2	inches. 3	inches. 2	inches. $2\frac{1}{2}$	inches. 2	inches. $2\frac{1}{4}$	inches. $12\frac{1}{2}$	inches. 2	inches. 12	2600 and under 3400
3400 and under 5200	$8\frac{1}{2} \times \frac{7}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	3	2	$3\frac{1}{2}$	2	3	2	$2\frac{1}{2}$	14	$2\frac{1}{4}$	13	3400 and under 5200
5200 and under 7200	$10 \times \frac{8}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3\frac{1}{2}$	2	$3\frac{3}{4}$	$2\frac{1}{4}$	3	2	$2\frac{3}{4}$	15	$2\frac{1}{2}$	14	5200 and under 7200
7200 and under 8900	$11 \times \frac{9}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3\frac{3}{4}$	$2\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	3	16	$2\frac{3}{4}$	15	7200 and under 8900
8900 and under 10450	$12 \times \frac{9}{16}$	$\frac{6}{16}$	$4 \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{6}{16}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	17	$2\frac{3}{4}$	15	8900 and under 10450
10450 and under 11800	$12 \times \frac{10}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	18	3	16	10450 and under 11800
11800 and under 13100	$13 \times \frac{10}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{3}{4}$	$2\frac{3}{4}$	5	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{5}{8}$	19	$3\frac{1}{4}$	17	11800 and under 13100
13100 and under 14300	$14 \times \frac{11}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	5	3	$5\frac{1}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{3}{4}$	20	$3\frac{1}{4}$	17	13100 and under 14300
14300 and under 15500	$15 \times \frac{11}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{4}$	3	$5\frac{1}{2}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	4	21	$3\frac{1}{2}$	18	14300 and under 15500
15500 and under 16600	$16 \times \frac{12}{16}$	$\frac{8}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$5\frac{1}{2}$	3	$5\frac{3}{4}$	3	4	$2\frac{1}{2}$	$4\frac{1}{4}$	22	$3\frac{5}{8}$	19	15500 and under 16600
16600 and under 18700	$17 \times \frac{12}{16}$	$\frac{8}{16}$	$5 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	6	3	$6\frac{1}{4}$	$3\frac{1}{4}$	4	$2\frac{1}{2}$	$4\frac{1}{2}$	23	$3\frac{5}{8}$	19	16600 and under 18700
18700 and under 21700	$18 \times \frac{13}{16}$	$\frac{8}{16}$	$5\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$6\frac{1}{4}$	$3\frac{1}{4}$	7	$3\frac{1}{2}$	4	$2\frac{1}{2}$	$4\frac{5}{8}$	24	4	21	18700 and under 21700
21700 and under 26400	$19 \times \frac{13}{16}$	$\frac{9}{16}$	$6 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$6\frac{3}{4}$	$3\frac{1}{2}$	$7\frac{3}{4}$	$3\frac{3}{4}$	4	$2\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	$4\frac{1}{2}$	23	21700 and under 26400
26400 and under 30900	$21 \times \frac{14}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$7\frac{1}{2}$	$3\frac{3}{4}$	$8\frac{1}{2}$	4	4	$2\frac{1}{2}$	$4\frac{3}{4}$	27	$4\frac{5}{8}$	24	26400 and under 30900
30900 and under 35200	$23 \times \frac{14}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	8	4	9	$4\frac{1}{2}$	4	$2\frac{1}{2}$	$4\frac{3}{4}$	$28\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	30900 and under 35200
35200 and under 40000	$26 \times \frac{14}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$9\frac{1}{2}$	$4\frac{3}{4}$	4	$2\frac{1}{2}$	5	30	$4\frac{3}{4}$	27	35200 and under 40000
40000 and under 48500	$28 \times \frac{14}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	—	—	10	5	4	$2\frac{1}{2}$	—	—	—	—	40000 and under 48500
48500 and under 56000	$30 \times \frac{15}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	—	—	$10\frac{1}{2}$	$5\frac{1}{4}$	4	$2\frac{1}{2}$	—	—	—	—	48500 and under 56000
56000 and under 67000	$32 \times \frac{15}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	—	—	11	$5\frac{1}{2}$	4	$2\frac{1}{2}$	—	—	—	—	56000 and under 67000

(*a*) When the deck is of Teak, it may be one-sixth less in thickness. When of iron it is to be in thickness as per Table G. 4, but where an iron deck is substituted for a wood one, it is not to be less than $\frac{1}{16}$ ins.

(*aa*) The top and bottom plates of box keelsons to be one-sixteenth of an inch more in thickness than the side plates.

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed eleven times their depth from top of keel, see Section 1. For Vessels which exceed this proportion, see Section 46. For proportions of breadth to length, see Table G. 4.

DIAMETER OF NUT AND SCREW BOLTS FOR FASTENING
FLAT OF DECK.

3 ins. and under $3\frac{1}{2}$ ins.	...	...	...	...	$\frac{1}{2}$ inch.
$3\frac{1}{2}$ " " 4 " "	...	...	...	...	$\frac{9}{16}$ "
4 inches	...	...	...	...	$\frac{5}{8}$ "

Beams.

TABLE G 3.

Semi-box beams may be adopted in lieu thereof, formed of bulb plate and single angle irons of the sizes given for ordinary beams, secured in the usual way to two consecutive frames, and plated over by plating five sixteenths of an inch in thickness.

*Lloyd's Register of Shipping,
London, 19th May, 1887.*

iron deck prescribed either for the entire breadth as given in the Table or for the middle third of the breadth, in the case of three-decked vessels. In the latter case the stringer plates may be omitted in the middle third of the breadth.

IRON VESSELS.

TABLE G 4.

Table of Minimum Dimensions of Stringer Plates, Iron Decks, and Tie Plates.

Table of Minimum Dimensions of Stringer Plates, Iron Decks, and Tie Plates.																																																																				PLATING NUMBERS OF VESSELS
PLATING NUMBERS OF VESSELS	2000 to 3000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000	27000	28000	29000	31000	32000	34000	35000	36000	38000	39000	40000	42000	44000	46000	48000	50000	52000	54000	57000	60000	64000	68000																						
Dimensions of Main Stringer Plates, &c.	Under 10 Depths, or Under 7 Breadths in Length.	20× $\frac{5}{16}$	20× $\frac{5}{16}$	23× $\frac{5}{16}$	26× $\frac{5}{16}$	28× $\frac{5}{16}$	28× $\frac{7}{16}$	30× $\frac{7}{16}$	32× $\frac{7}{16}$	32× $\frac{8}{16}$	34× $\frac{8}{16}$	36× $\frac{8}{16}$	36× $\frac{9}{16}$	40× $\frac{9}{16}$	42× $\frac{9}{16}$	42× $\frac{10}{16}$	44× $\frac{10}{16}$	46× $\frac{10}{16}$	48× $\frac{10}{16}$	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	56× $\frac{10}{16}$ Iron Deck, $\frac{1}{2}$ Length, $\frac{1}{16}$.	58× $\frac{10}{16}$	60× $\frac{10}{16}$	62× $\frac{10}{16}$	65× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	Under 10 Depths, or Under 7 Breadths in Length.																				
	10 to 11 Depths, or 7 to 7½ Breadths.	22× $\frac{5}{16}$	22× $\frac{5}{16}$	25× $\frac{5}{16}$	28× $\frac{5}{16}$	31× $\frac{5}{16}$	32× $\frac{7}{16}$	34× $\frac{7}{16}$	36× $\frac{7}{16}$	36× $\frac{8}{16}$	38× $\frac{8}{16}$	40× $\frac{8}{16}$	40× $\frac{9}{16}$	44× $\frac{9}{16}$	46× $\frac{9}{16}$	46× $\frac{10}{16}$	48× $\frac{10}{16}$	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	58× $\frac{10}{16}$	61× $\frac{10}{16}$	63× $\frac{10}{16}$	65× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	75× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	10 to 11 Depths, or 7 to 7½ Breadths.																						
	11 to 12 Depths, or 7½ to 8 Breadths.	24× $\frac{5}{16}$	25× $\frac{5}{16}$	28× $\frac{5}{16}$	31× $\frac{5}{16}$	34× $\frac{5}{16}$	36× $\frac{7}{16}$	38× $\frac{7}{16}$	40× $\frac{7}{16}$	40× $\frac{8}{16}$	42× $\frac{8}{16}$	44× $\frac{8}{16}$	44× $\frac{9}{16}$	48× $\frac{9}{16}$	50× $\frac{9}{16}$	50× $\frac{10}{16}$	48× $\frac{10}{16}$ Iron Deck, half Length, $\frac{1}{16}$.	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	58× $\frac{10}{16}$	60× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	75× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	11 to 12 Depths, or 7½ to 8 Breadths.																					
	12 to 13 Depths, or 8 to 8½ Breadths.	24× $\frac{5}{16}$	25× $\frac{7}{16}$	28× $\frac{7}{16}$	31× $\frac{7}{16}$	34× $\frac{7}{16}$	36× $\frac{8}{16}$	38× $\frac{8}{16}$	40× $\frac{8}{16}$	40× $\frac{9}{16}$	42× $\frac{9}{16}$	44× $\frac{9}{16}$	44× $\frac{10}{16}$	48× $\frac{10}{16}$	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	58× $\frac{10}{16}$	60× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	75× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	12 to 13 Depths, or 8 to 8½ Breadths.																								
	13 to 14 Depths, or 8½ to 9 Breadths.	27× $\frac{5}{16}$	28× $\frac{7}{16}$	31× $\frac{7}{16}$	34× $\frac{7}{16}$	37× $\frac{7}{16}$	40× $\frac{8}{16}$	42× $\frac{8}{16}$	44× $\frac{8}{16}$	44× $\frac{9}{16}$	46× $\frac{9}{16}$	48× $\frac{9}{16}$	48× $\frac{10}{16}$	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	55× $\frac{10}{16}$	57× $\frac{10}{16}$	59× $\frac{10}{16}$	60× $\frac{10}{16}$	61× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	75× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	13 to 14 Depths, or 8½ to 9 Breadths.																							
	14 to 15 Depths, or 9 to 9½ Breadths.	30× $\frac{5}{16}$	31× $\frac{7}{16}$	31× $\frac{8}{16}$	34× $\frac{8}{16}$	37× $\frac{8}{16}$	40× $\frac{9}{16}$	42× $\frac{9}{16}$	44× $\frac{9}{16}$	44× $\frac{10}{16}$	46× $\frac{10}{16}$	48× $\frac{10}{16}$	48× $\frac{11}{16}$	50× $\frac{11}{16}$	52× $\frac{11}{16}$	54× $\frac{11}{16}$	56× $\frac{11}{16}$	58× $\frac{11}{16}$	60× $\frac{11}{16}$	61× $\frac{11}{16}$	62× $\frac{11}{16}$	64× $\frac{11}{16}$	66× $\frac{11}{16}$	68× $\frac{11}{16}$	70× $\frac{11}{16}$	72× $\frac{11}{16}$	74× $\frac{11}{16}$	76× $\frac{11}{16}$	77× $\frac{11}{16}$	78× $\frac{11}{16}$	79× $\frac{11}{16}$	80× $\frac{11}{16}$	82× $\frac{11}{16}$	84× $\frac{11}{16}$	86× $\frac{11}{16}$	88× $\frac{11}{16}$	90× $\frac{11}{16}$	92× $\frac{11}{16}$	94× $\frac{11}{16}$	96× $\frac{11}{16}$	98× $\frac{11}{16}$	100× $\frac{11}{16}$	14 to 15 Depths, or 9 to 9½ Breadths.																									
	15 to 16 Depths, or 9½ to 10 Breadths.	33× $\frac{5}{16}$	34× $\frac{7}{16}$	34× $\frac{8}{16}$	38× $\frac{8}{16}$	40× $\frac{9}{16}$	44× $\frac{9}{16}$	46× $\frac{9}{16}$	48× $\frac{9}{16}$	48× $\frac{10}{16}$	50× $\frac{10}{16}$	52× $\frac{10}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	57× $\frac{10}{16}$	58× $\frac{10}{16}$	59× $\frac{10}{16}$	60× $\frac{10}{16}$	61× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	15 to 16 Depths, or 9½ to 10 Breadths.																										
	16 to 17 Depths, or 10 to 10½ Breadths.	—	—	—	—	—	—	49× $\frac{9}{16}$	51× $\frac{9}{16}$	53× $\frac{9}{16}$	54× $\frac{10}{16}$	56× $\frac{10}{16}$	57× $\frac{10}{16}$	58× $\frac{10}{16}$	59× $\frac{10}{16}$	60× $\frac{10}{16}$	61× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	16 to 17 Depths, or 10 to 10½ Breadths.																												
Over 17 Depths, or Over 10½ Breadths.	—	—	—	—	—	—	—	—	—	54× $\frac{10}{16}$	56× $\frac{10}{16}$	57× $\frac{10}{16}$	58× $\frac{10}{16}$	59× $\frac{10}{16}$	60× $\frac{10}{16}$	61× $\frac{10}{16}$	62× $\frac{10}{16}$	64× $\frac{10}{16}$	66× $\frac{10}{16}$	68× $\frac{10}{16}$	70× $\frac{10}{16}$	72× $\frac{10}{16}$	74× $\frac{10}{16}$	76× $\frac{10}{16}$	77× $\frac{10}{16}$	78× $\frac{10}{16}$	79× $\frac{10}{16}$	80× $\frac{10}{16}$	82× $\frac{10}{16}$	84× $\frac{10}{16}$	86× $\frac{10}{16}$	88× $\frac{10}{16}$	90× $\frac{10}{16}$	92× $\frac{10}{16}$	94× $\frac{10}{16}$	96× $\frac{10}{16}$	98× $\frac{10}{16}$	100× $\frac{10}{16}$	Over 17 Depths, or Over 10½ Breadths.																													
Ends of Stringer Plates.	—	—	15× $\frac{5}{16}$	17× $\frac{5}{16}$	19× $\frac{5}{16}$	19× $\frac{6}{16}$	20× $\frac{6}{16}$	22× $\frac{6}{16}$	22× $\frac{7}{16}$	23× $\frac{7}{16}$	24× $\frac{7}{16}$	24× $\frac{8}{16}$	26× $\frac{8}{16}$	28× $\frac{8}{16}$	28× $\frac{9}{16}$	29× $\frac{9}{16}$	30× $\frac{9}{16}$	31× $\frac{9}{16}$	32× $\frac{9}{16}$	33× $\frac{9}{16}$	35× $\frac{9}{16}$	36× $\frac{9}{16}$	36× $\frac{10}{16}$	37× $\frac{10}{16}$	38× $\frac{10}{16}$	40× $\frac{10}{16}$	41× $\frac{10}{16}$	42× $\frac{10}{16}$	43× $\frac{10}{16}$	44× $\frac{10}{16}$	45× $\frac{10}{16}$	45× $\frac{11}{16}$	46× $\frac{11}{16}$	47× $\frac{11}{16}$	48× $\frac{11}{16}$	49× $\frac{11}{16}$	50× $\frac{11}{16}$	51× $\frac{11}{16}$	52× $\frac{11}{16}$	53× $\frac{11}{16}$	54× $\frac{11}{16}$	55× $\frac{11}{16}$	56× $\frac{11}{16}$	57× $\frac{11}{16}$	58× $\frac{11}{16}$	59× $\frac{11}{16}$	60× $\frac{11}{16}$	Ends of Main Stringer Plates.																				
Hold Beam Stringer Plates (extreme breadth) Ends of ditto.	—	—	—	—	—	20× $\frac{6}{16}$	21× $\frac{6}{16}$	22× $\frac{6}{16}$	23× $\frac{6}{16}$	25× $\frac{6}{16}$	27× $\frac{6}{16}$	28× $\frac{6}{16}$	29× $\frac{6}{16}$	30× $\frac{6}{16}$	31× $\frac{6}{16}$	32× $\frac{6}{16}$	33× $\frac{6}{16}$	34× $\frac{6}{16}$	35× $\frac{6}{16}$	37× $\frac{6}{16}$	38× $\frac{6}{16}$	39× $\frac{6}{16}</$																																														

The depths for proportions to be taken from upper side of keel to top of upper deck beams in one, two, and three deck ships, and to top of main deck in spar and awning deck vessels; and, in spar-decked vessels, one depth may be taken off the proportions, so that in a spar-decked vessel of twelve and under thirteen depths in length, the stringers, &c., may be of the sizes given in the above Table for vessels of eleven and under twelve depths in length; and so on.

In two decked vessels the stringer plates indicated with regard to the vessel's proportions in the above Table are to be fitted to the upper deck beams.

In three decked vessels the stringer plates so indicated in the above Table are to be fitted to the upper deck beams, and the stringer and tie plates required for the middle deck beams are to be of the same width as those given in the Table, but they may be one-sixteenth of an inch less in thickness.

In spar decked vessels the stringer plates given in the above Table are to be fitted to the main deck beams; and the stringer plates required for the spar deck beams are to be the breadth of, and may be two-sixteenths of an inch less in thickness than the stringer plates given on the upper line of the Table for vessels of the same plating number, and may be reduced at their ends to seven-sixteenths of an inch thick and to the breadth given for the ends of the main deck stringer plate in the Table.

In awning decked vessels the stringer plates given in the above Table are to be fitted to the main deck beams, and the stringer plates required for the awning deck beams are to be of the same width as those given in the Table for hold beam stringer plates, and to be six-sixteenths of an inch in thickness where the plating number is under 14,000, and seven-sixteenths of an inch where the plating number is 14,000 or above.

All stringer plates are to maintain their midship breadth for one-half the vessel's length amidships, from thence the breadth may be gradually reduced to that given above for the ends of the vessel.

Where a reduction of two-sixteenths of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced one-sixteenth of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships, and from thence to the ends they may be reduced another sixteenth of an inch in the thickness.

Where there is an iron deck prescribed either for the entire length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two decked vessels. In three decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

In way of an iron deck or half-iron deck, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above. Where more than one iron deck is required the stringer plates are to be of the breadth and thickness given in the Table.

Where an iron deck is prescribed in the Table to be fitted for one half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one-eighth the vessel's length at each end.

Orlop stringer plates where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie plates are to be fitted all fore and aft on the upper deck.

In sailing vessels whose plating number is under 15,000, and in steam vessels not requiring an iron deck, if diagonal tie plates be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

IRON VESSELS.

PLATING NUMBERS OF VESSELS.	2000	3000	4000	5000	6000	7000	8000	9000	10000
Under 10 fathoms or Under 10 fathoms in length	20x4	20x4	20x4	20x4	20x4	20x4	20x4	20x4	20x4
10 to 11 fathoms or 11 to 12 fathoms	21x4	21x4	21x4	21x4	21x4	21x4	21x4	21x4	21x4
12 to 13 fathoms or 13 to 14 fathoms	22x4	22x4	22x4	22x4	22x4	22x4	22x4	22x4	22x4
14 to 15 fathoms or 15 to 16 fathoms	23x4	23x4	23x4	23x4	23x4	23x4	23x4	23x4	23x4
16 to 17 fathoms or 17 to 18 fathoms	24x4	24x4	24x4	24x4	24x4	24x4	24x4	24x4	24x4
18 to 19 fathoms or 19 to 20 fathoms	25x4	25x4	25x4	25x4	25x4	25x4	25x4	25x4	25x4
20 to 21 fathoms or 21 to 22 fathoms	26x4	26x4	26x4	26x4	26x4	26x4	26x4	26x4	26x4
22 to 23 fathoms or 23 to 24 fathoms	27x4	27x4	27x4	27x4	27x4	27x4	27x4	27x4	27x4
24 to 25 fathoms or 25 to 26 fathoms	28x4	28x4	28x4	28x4	28x4	28x4	28x4	28x4	28x4
26 to 27 fathoms or 27 to 28 fathoms	29x4	29x4	29x4	29x4	29x4	29x4	29x4	29x4	29x4
28 to 29 fathoms or 29 to 30 fathoms	30x4	30x4	30x4	30x4	30x4	30x4	30x4	30x4	30x4
30 to 31 fathoms or 31 to 32 fathoms	31x4	31x4	31x4	31x4	31x4	31x4	31x4	31x4	31x4
32 to 33 fathoms or 33 to 34 fathoms	32x4	32x4	32x4	32x4	32x4	32x4	32x4	32x4	32x4
34 to 35 fathoms or 35 to 36 fathoms	33x4	33x4	33x4	33x4	33x4	33x4	33x4	33x4	33x4
36 to 37 fathoms or 37 to 38 fathoms	34x4	34x4	34x4	34x4	34x4	34x4	34x4	34x4	34x4
38 to 39 fathoms or 39 to 40 fathoms	35x4	35x4	35x4	35x4	35x4	35x4	35x4	35x4	35x4
40 to 41 fathoms or 41 to 42 fathoms	36x4	36x4	36x4	36x4	36x4	36x4	36x4	36x4	36x4
42 to 43 fathoms or 43 to 44 fathoms	37x4	37x4	37x4	37x4	37x4	37x4	37x4	37x4	37x4
44 to 45 fathoms or 45 to 46 fathoms	38x4	38x4	38x4	38x4	38x4	38x4	38x4	38x4	38x4
46 to 47 fathoms or 47 to 48 fathoms	39x4	39x4	39x4	39x4	39x4	39x4	39x4	39x4	39x4
48 to 49 fathoms or 49 to 50 fathoms	40x4	40x4	40x4	40x4	40x4	40x4	40x4	40x4	40x4
50 to 51 fathoms or 51 to 52 fathoms	41x4	41x4	41x4	41x4	41x4	41x4	41x4	41x4	41x4
52 to 53 fathoms or 53 to 54 fathoms	42x4	42x4	42x4	42x4	42x4	42x4	42x4	42x4	42x4
54 to 55 fathoms or 55 to 56 fathoms	43x4	43x4	43x4	43x4	43x4	43x4	43x4	43x4	43x4
56 to 57 fathoms or 57 to 58 fathoms	44x4	44x4	44x4	44x4	44x4	44x4	44x4	44x4	44x4
58 to 59 fathoms or 59 to 60 fathoms	45x4	45x4	45x4	45x4	45x4	45x4	45x4	45x4	45x4
60 to 61 fathoms or 61 to 62 fathoms	46x4	46x4	46x4	46x4	46x4	46x4	46x4	46x4	46x4
62 to 63 fathoms or 63 to 64 fathoms	47x4	47x4	47x4	47x4	47x4	47x4	47x4	47x4	47x4
64 to 65 fathoms or 65 to 66 fathoms	48x4	48x4	48x4	48x4	48x4	48x4	48x4	48x4	48x4
66 to 67 fathoms or 67 to 68 fathoms	49x4	49x4	49x4	49x4	49x4	49x4	49x4	49x4	49x4
68 to 69 fathoms or 69 to 70 fathoms	50x4	50x4	50x4	50x4	50x4	50x4	50x4	50x4	50x4
70 to 71 fathoms or 71 to 72 fathoms	51x4	51x4	51x4	51x4	51x4	51x4	51x4	51x4	51x4
72 to 73 fathoms or 73 to 74 fathoms	52x4	52x4	52x4	52x4	52x4	52x4	52x4	52x4	52x4
74 to 75 fathoms or 75 to 76 fathoms	53x4	53x4	53x4	53x4	53x4	53x4	53x4	53x4	53x4
76 to 77 fathoms or 77 to 78 fathoms	54x4	54x4	54x4	54x4	54x4	54x4	54x4	54x4	54x4
78 to 79 fathoms or 79 to 80 fathoms	55x4	55x4	55x4	55x4	55x4	55x4	55x4	55x4	55x4
80 to 81 fathoms or 81 to 82 fathoms	56x4	56x4	56x4	56x4	56x4	56x4	56x4	56x4	56x4
82 to 83 fathoms or 83 to 84 fathoms	57x4	57x4	57x4	57x4	57x4	57x4	57x4	57x4	57x4
84 to 85 fathoms or 85 to 86 fathoms	58x4	58x4	58x4	58x4	58x4	58x4	58x4	58x4	58x4
86 to 87 fathoms or 87 to 88 fathoms	59x4	59x4	59x4	59x4	59x4	59x4	59x4	59x4	59x4
88 to 89 fathoms or 89 to 90 fathoms	60x4	60x4	60x4	60x4	60x4	60x4	60x4	60x4	60x4
90 to 91 fathoms or 91 to 92 fathoms	61x4	61x4	61x4	61x4	61x4	61x4	61x4	61x4	61x4
92 to 93 fathoms or 93 to 94 fathoms	62x4	62x4	62x4	62x4	62x4	62x4	62x4	62x4	62x4
94 to 95 fathoms or 95 to 96 fathoms	63x4	63x4	63x4	63x4	63x4	63x4	63x4	63x4	63x4
96 to 97 fathoms or 97 to 98 fathoms	64x4	64x4	64x4	64x4	64x4	64x4	64x4	64x4	64x4
98 to 99 fathoms or 99 to 100 fathoms	65x4	65x4	65x4	65x4	65x4	65x4	65x4	65x4	65x4
100 to 101 fathoms or 101 to 102 fathoms	66x4	66x4	66x4	66x4	66x4	66x4	66x4	66x4	66x4
102 to 103 fathoms or 103 to 104 fathoms	67x4	67x4	67x4	67x4	67x4	67x4	67x4	67x4	67x4
104 to 105 fathoms or 105 to 106 fathoms	68x4	68x4	68x4	68x4	68x4	68x4	68x4	68x4	68x4
106 to 107 fathoms or 107 to 108 fathoms	69x4	69x4	69x4	69x4	69x4	69x4	69x4	69x4	69x4
108 to 109 fathoms or 109 to 110 fathoms	70x4	70x4	70x4	70x4	70x4	70x4	70x4	70x4	70x4
110 to 111 fathoms or 111 to 112 fathoms	71x4	71x4	71x4	71x4	71x4	71x4	71x4	71x4	71x4
112 to 113 fathoms or 113 to 114 fathoms	72x4	72x4	72x4	72x4	72x4	72x4	72x4	72x4	72x4
114 to 115 fathoms or 115 to 116 fathoms	73x4	73x4	73x4	73x4	73x4	73x4	73x4	73x4	73x4
116 to 117 fathoms or 117 to 118 fathoms	74x4	74x4	74x4	74x4	74x4	74x4	74x4	74x4	74x4
118 to 119 fathoms or 119 to 120 fathoms	75x4	75x4	75x4	75x4	75x4	75x4	75x4	75x4	75x4
120 to 121 fathoms or 121 to 122 fathoms	76x4	76x4	76x4	76x4	76x4	76x4	76x4	76x4	76x4
122 to 123 fathoms or 123 to 124 fathoms	77x4	77x4	77x4	77x4	77x4	77x4	77x4	77x4	77x4
124 to 125 fathoms or 125 to 126 fathoms	78x4	78x4	78x4	78x4	78x4	78x4	78x4	78x4	78x4
126 to 127 fathoms or 127 to 128 fathoms	79x4	79x4	79x4	79x4	79x4	79x4	79x4	79x4	79x4
128 to 129 fathoms or 129 to 130 fathoms	80x4	80x4	80x4	80x4	80x4	80x4	80x4	80x4	80x4
130 to 131 fathoms or 131 to 132 fathoms	81x4	81x4	81x4	81x4	81x4	81x4	81x4	81x4	81x4
132 to 133 fathoms or 133 to 134 fathoms	82x4	82x4	82x4	82x4	82x4	82x4	82x4	82x4	82x4
134 to 135 fathoms or 135 to 136 fathoms	83x4	83x4	83x4	83x4	83x4	83x4	83x4	83x4	83x4
136 to 137 fathoms or 137 to 138 fathoms	84x4	84x4	84x4	84x4	84x4	84x4	84x4	84x4	84x4
138 to 139 fathoms or 139 to 140 fathoms	85x4	85x4	85x4	85x4	85x4	85x4	85x4	85x4	85x4
140 to 141 fathoms or 141 to 142 fathoms	86x4	86x4	86x4	86x4	86x4	86x4	86x4	86x4	86x4
142 to 143 fathoms or 143 to 144 fathoms	87x4	87x4	87x4	87x4	87x4	87x4	87x4	87x4	87x4
144 to 145 fathoms or 145 to 146 fathoms	88x4	88x4	88x4	88x4	88x4	88x4	88x4	88x4	88x4
146 to 147 fathoms or 147 to 148 fathoms	89x4	89x4	89x4	89x4	89x4	89x4	89x4	89x4	89x4
148 to 149 fathoms or 149 to 150 fathoms	90x4	90x4	90x4	90x4	90x4	90x4	90x4	90x4	90x4
150 to 151 fathoms or 151 to 152 fathoms	91x4	91x4	91x4	91x4	91x4	91x4	91x4	91x4	91x4
152 to 153 fathoms or 153 to 154 fathoms	92x4	92x4	92x4	92x4	92x4	92x4	92x4	92x4	92x4
154 to 155 fathoms or 155 to 156 fathoms	93x4	93x4	93x4	93x4	93x4	93x4	93x4	93x4	93x4
156 to 157 fathoms or 157 to 158 fathoms	94x4	94x4	94x4	94x4	94x4	94x4	94x4	94x4	94x4
158 to 159 fathoms or 159 to 160 fathoms	95x4	95x4	95x4	95x4	95x4	95x4	95x4	95x4	95x4
160 to 161 fathoms or 161 to 162 fathoms	96x4	96x4	96x4	96x4	96x4	96x4	96x4	96x4	96x4
162 to 163 fathoms or 163 to 164 fathoms	97x4	97x4	97x4	97x4	97x4	97x4	97x4	97x4	97x4
164 to 165 fathoms or 165 to 166 fathoms	98x4	98x4	98x4	98x4	98x4	98x4	98x4	98x4	98x4
166 to 167 fathoms or 167 to 168 fathoms	99x4	99x4	99x4	99x4	99x4	99x4	99x4	99x4	99x4
168 to 169 fathoms or 169 to 170 fathoms	100x4	100x4	100x4	100x4	100x4	100x4	100x4	100x4	100x4
170 to 171 fathoms or 171 to 172 fathoms	101x4	101x4	101x4	101x4	101x4	101x4	101x4	101x4	101x4
172 to 173 fathoms or 173 to 174 fathoms	102x4	102x4	102x4	102x4	102x4	102x4	102x4	102x4	102x4
174 to 175 fathoms or 175 to 176 fathoms	103x4	103x4	103x4	103x4	103x4	103x4	103x4	103x4	103x4
176 to 177 fathoms or 177 to 178 fathoms	104x4	104x4	104x4	104x4	104x4	104x4	104x4	104x4	104x4
178 to 179 fathoms or 179 to 180 fathoms	105x4	105x4	105x4	105x4	105x4	105x4	105x4	105x4	105x4
180 to 181 fathoms or 181 to 182 fathoms	106x4	106x4	106x4	106x4	106x4	106x4	106x4	106x4	106x4
182 to 183 fathoms or 183 to 184 fathoms	107x4	107x4	107x4	107x4	107x4	107x4	107x4	107x4	107x4
184 to 185 fathoms or 185 to 186 fathoms	108x4	108x4	108x4	108x4	108x4	108x4	108x4	108x4	108x4
186 to 187 fathoms or 187 to 188 fathoms	109x4	109x4	109x4	109x4	109x4	109x4	109x4	109x4	109x4
188 to 189 fathoms or 189 to 190 fathoms	110x4	110x4	110x4	110x4	110x4	110x4	110x4	110x4	110x4
190 to 191 fathoms or 191 to 192 fathoms	111x4	111x4	111x4	111x4	111x4	111x4	111x4	111x4	111x4
192 to 193 fathoms or 193 to 194 fathoms	112x4	112x4	112x4	112x4	112x4	112x4	112x4	112x4	112x4
194 to 195 fathoms or 195 to 196 fathoms	113x4	113x4	113x4	113x4	113x4	113x4	113x4	113x4	113x4
196 to 197 fathoms or 197 to 198 fathoms	114x4	114x4	114x4	114x4	114x4	114x4	114x4	114x4	114x4
198 to 199 fathoms or 199 to 200 fathoms	115x4	115x4	115x4	115x4	115x4	115x4	115x4	115x4	115x4
200 to 201 fathoms or 201 to 202 fathoms	116x4	116x4	116x4	116x4	116x4	116x4	116x4	116x4	116x4
202 to 203 fathoms or 203 to 204 fathoms	117x4	117x4	117x4	117x4	117x4	117x4	117x4	117x4	117x4
204 to 205 fathoms or 205 to 206 fathoms	118x4	118x4	118x4	118x4	118x4	118x4	118x4	118x4	118x4
206 to 207 fathoms or 207 to 208 fathoms	119x4	119x4	119x4	119x4	119x4	119x4	119x4	119x4	119x4
208 to 209 fathoms or 209 to 210 fathoms	120x4	120x4	120x4	120x4	120x4	120x4	120x4	120x4	120x4
210 to 211 fathoms or 211 to 212 fathoms	121x4	121x4	121x4	121x4	121x4	121x4	121x4	121x4	121x4
212 to 213 fathoms or 213 to 214 fathoms	122x4	122x4							

IRON VESSELS.

TABLE G 5.

Showing diameters and spacing of Rivets and breadths of Straps and Laps.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Thickness of PLATES	$\frac{5}{16}$	$\frac{6}{16}$	$\frac{6\frac{1}{2}}{16}$ alternately	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{9\frac{1}{2}}{16}$ alternately	$\frac{10}{16}$ (6)	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12\frac{1}{2}}{16}$ alternately	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{16}{16}$
Diameter of RIVETS	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$
Breadth of TREBLE riveted STRAPS .....	....	....	....	....	$14\frac{1}{4}$	$14\frac{1}{4}$	$14\frac{1}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	19	19	19	$21\frac{1}{4}$	$21\frac{1}{4}$
" " DOUBLE " " 	8	8	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	....	....	....	....	....
" " DOUBLE " LAPS	$3\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	6	6	6	$6\frac{3}{4}$	$6\frac{3}{4}$
" " SINGLE " " 	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	....	....	....	....	....	....	....	....	....	....
MAXIMUM Spacing } in BUTTS of outside plating	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3	3	3	3	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$
of Rivets from } in EDGES " "	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	5	5
centre to centre.... } in FRAMES	5	5	6	6	6	6	6	7	7	7	8	8	8	....	....

Minimum number of Rivets in edges of Plating between Frames AMIDSHIPS.

DIAMETER OF RIVETS.....	NUMBER OF RIVETS IN EACH ROW.														
	Ins. $\frac{5}{8}$	Ins. $\frac{5}{8}$	Ins. $\frac{3}{4}$	Ins. $\frac{3}{4}$	Ins. $\frac{3}{4}$	Ins. $\frac{3}{4}$	Ins. $\frac{3}{4}$	Ins. $\frac{7}{8}$	Ins. $\frac{7}{8}$	Ins. $\frac{7}{8}$	Ins. 1	Ins. 1	Ins. 1	Ins. $1\frac{1}{8}$	Ins. $1\frac{1}{8}$
Spacing of FRAMES .....20 ins.....	7	7	5	5	5	5	....	....	....	....	....	....	....	....	....
" " " 21 " 	7	6	6	6	6	6	5	5	....	....	....	....	....	....
" " " 22 " 	6	6	6	6	6	5	5	5	....	....	....	....	....
" " " 23 " 	6	6	6	6	6	5	5	5	5	5	5	....	....
" " " 24 " 	7	7	7	7	7	6	6	6	5	5	5	....	....
" " " 26 " 	5	5	5	5

Where the fore and aft flange of the frame does not exceed 3 inches, the rivets attaching the outside plating thereto should not exceed $\frac{7}{8}$ inch in diameter, and where it is $3\frac{1}{2}$ inches wide, they should not exceed 1 inch in diameter.

(b) Where stringer and tie plates are $\frac{1}{16}$ of an inch thick, they should be secured to the beams with $\frac{3}{4}$ of an inch rivets.

RIVETS to be $\frac{1}{4}$ of an inch larger in diameter in the STEM, STERN POST and KEEL, but in no case need these exceed $1\frac{1}{4}$ inches in diameter

RIVETS in RUDDER to be of not less size than required for the upper edge of garboard strake amidships. See Section 36.

IRON VESSELS.

TABLE G. 5.

Showing diameters and spacing of Rivets and breadths

Thickness of Plates				Diameter of Rivets				Breadth of Transverse Riveted Straps				Maximum Spacing of Rivets from			
												in Butts of outside plating			
												in Edges			
												in Frames			
1/2	3/8	1 1/2	1 1/4	1/2	3/8	1 1/2	1 1/4	1/2	3/8	1 1/2	1 1/4	1/2	3/8	1 1/2	1 1/4
3/4	1/2	2	1 3/4	3/4	1/2	2	1 3/4	3/4	1/2	2	1 3/4	3/4	1/2	2	1 3/4
1	5/8	2 1/2	2	1	5/8	2 1/2	2	1	5/8	2 1/2	2	1	5/8	2 1/2	2
1 1/4	3/4	3	2 1/4	1 1/4	3/4	3	2 1/4	1 1/4	3/4	3	2 1/4	1 1/4	3/4	3	2 1/4
1 1/2	7/8	3 1/2	2 3/4	1 1/2	7/8	3 1/2	2 3/4	1 1/2	7/8	3 1/2	2 3/4	1 1/2	7/8	3 1/2	2 3/4
1 3/4	1	4	3	1 3/4	1	4	3	1 3/4	1	4	3	1 3/4	1	4	3
2	1 1/8	4 1/2	3 1/4	2	1 1/8	4 1/2	3 1/4	2	1 1/8	4 1/2	3 1/4	2	1 1/8	4 1/2	3 1/4
2 1/4	1 1/4	5	3 1/2	2 1/4	1 1/4	5	3 1/2	2 1/4	1 1/4	5	3 1/2	2 1/4	1 1/4	5	3 1/2
2 1/2	1 1/2	5 1/2	3 3/4	2 1/2	1 1/2	5 1/2	3 3/4	2 1/2	1 1/2	5 1/2	3 3/4	2 1/2	1 1/2	5 1/2	3 3/4
2 3/4	1 3/4	6	4	2 3/4	1 3/4	6	4	2 3/4	1 3/4	6	4	2 3/4	1 3/4	6	4
3	1 7/8	6 1/2	4 1/4	3	1 7/8	6 1/2	4 1/4	3	1 7/8	6 1/2	4 1/4	3	1 7/8	6 1/2	4 1/4
3 1/4	2	7	4 1/2	3 1/4	2	7	4 1/2	3 1/4	2	7	4 1/2	3 1/4	2	7	4 1/2
3 1/2	2 1/8	7 1/2	4 3/4	3 1/2	2 1/8	7 1/2	4 3/4	3 1/2	2 1/8	7 1/2	4 3/4	3 1/2	2 1/8	7 1/2	4 3/4
3 3/4	2 1/4	8	5	3 3/4	2 1/4	8	5	3 3/4	2 1/4	8	5	3 3/4	2 1/4	8	5
4	2 1/2	8 1/2	5 1/4	4	2 1/2	8 1/2	5 1/4	4	2 1/2	8 1/2	5 1/4	4	2 1/2	8 1/2	5 1/4
4 1/4	2 3/4	9	5 1/2	4 1/4	2 3/4	9	5 1/2	4 1/4	2 3/4	9	5 1/2	4 1/4	2 3/4	9	5 1/2
4 1/2	2 7/8	9 1/2	5 3/4	4 1/2	2 7/8	9 1/2	5 3/4	4 1/2	2 7/8	9 1/2	5 3/4	4 1/2	2 7/8	9 1/2	5 3/4
4 3/4	3	10	6	4 3/4	3	10	6	4 3/4	3	10	6	4 3/4	3	10	6
5	3 1/8	10 1/2	6 1/4	5	3 1/8	10 1/2	6 1/4	5	3 1/8	10 1/2	6 1/4	5	3 1/8	10 1/2	6 1/4
5 1/4	3 1/4	11	6 1/2	5 1/4	3 1/4	11	6 1/2	5 1/4	3 1/4	11	6 1/2	5 1/4	3 1/4	11	6 1/2
5 1/2	3 1/2	11 1/2	6 3/4	5 1/2	3 1/2	11 1/2	6 3/4	5 1/2	3 1/2	11 1/2	6 3/4	5 1/2	3 1/2	11 1/2	6 3/4
5 3/4	3 3/4	12	7	5 3/4	3 3/4	12	7	5 3/4	3 3/4	12	7	5 3/4	3 3/4	12	7
6	4	12 1/2	7 1/4	6	4	12 1/2	7 1/4	6	4	12 1/2	7 1/4	6	4	12 1/2	7 1/4
6 1/4	4 1/4	13	7 1/2	6 1/4	4 1/4	13	7 1/2	6 1/4	4 1/4	13	7 1/2	6 1/4	4 1/4	13	7 1/2
6 1/2	4 1/2	13 1/2	7 3/4	6 1/2	4 1/2	13 1/2	7 3/4	6 1/2	4 1/2	13 1/2	7 3/4	6 1/2	4 1/2	13 1/2	7 3/4
6 3/4	4 3/4	14	8	6 3/4	4 3/4	14	8	6 3/4	4 3/4	14	8	6 3/4	4 3/4	14	8
7	5	14 1/2	8 1/4	7	5	14 1/2	8 1/4	7	5	14 1/2	8 1/4	7	5	14 1/2	8 1/4
7 1/4	5 1/4	15	8 1/2	7 1/4	5 1/4	15	8 1/2	7 1/4	5 1/4	15	8 1/2	7 1/4	5 1/4	15	8 1/2
7 1/2	5 1/2	15 1/2	8 3/4	7 1/2	5 1/2	15 1/2	8 3/4	7 1/2	5 1/2	15 1/2	8 3/4	7 1/2	5 1/2	15 1/2	8 3/4
7 3/4	5 3/4	16	9	7 3/4	5 3/4	16	9	7 3/4	5 3/4	16	9	7 3/4	5 3/4	16	9
8	6	16 1/2	9 1/4	8	6	16 1/2	9 1/4	8	6	16 1/2	9 1/4	8	6	16 1/2	9 1/4
8 1/4	6 1/4	17	9 1/2	8 1/4	6 1/4	17	9 1/2	8 1/4	6 1/4	17	9 1/2	8 1/4	6 1/4	17	9 1/2
8 1/2	6 1/2	17 1/2	9 3/4	8 1/2	6 1/2	17 1/2	9 3/4	8 1/2	6 1/2	17 1/2	9 3/4	8 1/2	6 1/2	17 1/2	9 3/4
8 3/4	6 3/4	18	10	8 3/4	6 3/4	18	10	8 3/4	6 3/4	18	10	8 3/4	6 3/4	18	10
9	7	18 1/2	10 1/4	9	7	18 1/2	10 1/4	9	7	18 1/2	10 1/4	9	7	18 1/2	10 1/4
9 1/4	7 1/4	19	10 1/2	9 1/4	7 1/4	19	10 1/2	9 1/4	7 1/4	19	10 1/2	9 1/4	7 1/4	19	10 1/2
9 1/2	7 1/2	19 1/2	10 3/4	9 1/2	7 1/2	19 1/2	10 3/4	9 1/2	7 1/2	19 1/2	10 3/4	9 1/2	7 1/2	19 1/2	10 3/4
9 3/4	7 3/4	20	11	9 3/4	7 3/4	20	11	9 3/4	7 3/4	20	11	9 3/4	7 3/4	20	11
10	8	20 1/2	11 1/4	10	8	20 1/2	11 1/4	10	8	20 1/2	11 1/4	10	8	20 1/2	11 1/4
10 1/4	8 1/4	21	11 1/2	10 1/4	8 1/4	21	11 1/2	10 1/4	8 1/4	21	11 1/2	10 1/4	8 1/4	21	11 1/2
10 1/2	8 1/2	21 1/2	11 3/4	10 1/2	8 1/2	21 1/2	11 3/4	10 1/2	8 1/2	21 1/2	11 3/4	10 1/2	8 1/2	21 1/2	11 3/4
10 3/4	8 3/4	22	12	10 3/4	8 3/4	22	12	10 3/4	8 3/4	22	12	10 3/4	8 3/4	22	12
11	9	22 1/2	12 1/4	11	9	22 1/2	12 1/4	11	9	22 1/2	12 1/4	11	9	22 1/2	12 1/4
11 1/4	9 1/4	23	12 1/2	11 1/4	9 1/4	23	12 1/2	11 1/4	9 1/4	23	12 1/2	11 1/4	9 1/4	23	12 1/2
11 1/2	9 1/2	23 1/2	12 3/4	11 1/2	9 1/2	23 1/2	12 3/4	11 1/2	9 1/2	23 1/2	12 3/4	11 1/2	9 1/2	23 1/2	12 3/4
11 3/4	9 3/4	24	13	11 3/4	9 3/4	24	13	11 3/4	9 3/4	24	13	11 3/4	9 3/4	24	13
12	10	24 1/2	13 1/4	12	10	24 1/2	13 1/4	12	10	24 1/2	13 1/4	12	10	24 1/2	13 1/4
12 1/4	10 1/4	25	13 1/2	12 1/4	10 1/4	25	13 1/2	12 1/4	10 1/4	25	13 1/2	12 1/4	10 1/4	25	13 1/2
12 1/2	10 1/2	25 1/2	13 3/4	12 1/2	10 1/2	25 1/2	13 3/4	12 1/2	10 1/2	25 1/2	13 3/4	12 1/2	10 1/2	25 1/2	13 3/4
12 3/4	10 3/4	26	14	12 3/4	10 3/4	26	14	12 3/4	10 3/4	26	14	12 3/4	10 3/4	26	14
13	11	26 1/2	14 1/4	13	11	26 1/2	14 1/4	13	11	26 1/2	14 1/4	13	11	26 1/2	14 1/4
13 1/4	11 1/4	27	14 1/2	13 1/4	11 1/4	27	14 1/2	13 1/4	11 1/4	27	14 1/2	13 1/4	11 1/4	27	14 1/2
13 1/2	11 1/2	27 1/2	14 3/4	13 1/2	11 1/2	27 1/2	14 3/4	13 1/2	11 1/2	27 1/2	14 3/4	13 1/2	11 1/2	27 1/2	14 3/4
13 3/4	11 3/4	28	15	13 3/4	11 3/4	28	15	13 3/4	11 3/4	28	15	13 3/4	11 3/4	28	15
14	12	28 1/2	15 1/4	14	12	28 1/2	15 1/4	14	12	28 1/2	15 1/4	14	12	28 1/2	15 1/4
14 1/4	12 1/4	29	15 1/2	14 1/4	12 1/4	29	15 1/2	14 1/4	12 1/4	29	15 1/2	14 1/4	12 1/4	29	15 1/2
14 1/2	12 1/2	29 1/2	15 3/4	14 1/2	12 1/2	29 1/2	15 3/4	14 1/2	12 1/2	29 1/2	15 3/4	14 1/2	12 1/2	29 1/2	15 3/4
14 3/4	12 3/4	30	16	14 3/4	12 3/4	30	16	14 3/4	12 3/4	30	16	14 3/4	12 3/4	30	16
15	13	30 1/2	16 1/4	15	13	30 1/2	16 1/4	15	13	30 1/2	16 1/4	15	13	30 1/2	16 1/4
15 1/4	13 1/4	31	16 1/2	15 1/4	13 1/4	31	16 1/2	15 1/4	13 1/4	31	16 1/2	15 1/4	13 1/4	31	16 1/2
15 1/2	13 1/2	31 1/2	16 3/4	15 1/2	13 1/2	31 1/2	16 3/4	15 1/2	13 1/2	31 1/2	16 3/4	15 1/2	13 1/2	31 1/2	16 3/4
15 3/4	13 3/4	32	17	15 3/4	13 3/4	32	17	15 3/4	13 3/4	32	17	15 3/4	13 3/4	32	17
16	14	32 1/2	17 1/4	16	14	32 1/2	17 1/4	16	14	32 1/2	17 1/4	16	14	32 1/2	17 1/4
16 1/4	14 1/4	33	17 1/2	16 1/4	14 1/4	33	17 1/2	16 1/4	14 1/4	33	17 1/2	16 1/4	14 1/4	33	17 1/2
16 1/2	14 1/2	33 1/2	17 3/4	16 1/2	14 1/2	33 1/2	17 3/4	16 1/2	14 1/2	33 1/2	17 3/4	16 1/2	14 1/2	33 1/2	17 3/4
16 3/4	14 3/4	34	18	16 3/4	14 3/4	34	18	16 3/4	14 3/4	34	18	16 3/4	14 3/4	34	18
17	15	34 1/2	18 1/4	17	15	34 1/2	18 1/4	17	15	34 1/2	18 1/4	17	15	34 1/2	18 1/4
17 1/4	15 1/4	35	18 1/2	17 1/4	15 1/4	35	18 1/2	17 1/4	15 1/4	35	18 1/2	17 1/4	15 1/4	35	18 1/2
17 1/2	15 1/2	35 1/2	18 3/4	17 1/2	15 1/2	35 1/2	18 3/4	17 1/2	15 1/2	35 1/2	18 3/4	17 1/2	15 1/2	35 1/2	18 3/4
17 3/4	15 3/4	36	19	17 3/4	15 3/4	36	19	17 3/4	15 3/4	36	19	17 3/4	15 3/4	36	19
18	16	36 1/2	19 1/4	18	16	36 1/2	19 1/4	18	16	36 1/2	19 1/4	18	16	36 1/2	19 1/4
18 1/4	16 1/4	37	19 1/2	18 1/4	16 1/4	37	19 1/2	18 1/4	16 1/4	37	19 1/2	18 1/4	16 1/4	37	19 1/2
18 1/2	16 1/2	37 1/2	19 3/4	18 1/2	16 1/2	37 1/2	19 3/4	18 1/2	16 1/2	37 1/2	19 3/4	18 1/2	16 1/2	37 1/2	19 3/4
18 3/4	16 3/4	38	20	18 3/4	16 3/4	38	20	18 3/4	16 3/4	38	20	18 3/4	16 3/4	38	20
19	17	38 1/2	20 1/4	19	17	38 1/2	20 1/4	19	17	38 1/2	20 1/4	19	17	38 1/2	20 1/4
19 1/4	17 1/4	39	20 1/2	19 1/4	17 1/4	39	20 1/2	19 1/4	17 1/4	39	20 1/2	19 1/4	17 1/4	39	20 1/2
19 1/2	17 1/2	39 1/2	20 3/4	19 1/2	17 1/2	39 1/									

IRON VESSELS.

TABLE G 6.

TABLE OF SCANTLINGS FOR DOUBLE BOTTOMS CONSTRUCTED ON THE CELLULAR SYSTEM.

PLATING NUMBER FOR REGULATING SCANTLINGS.	Centre Girder. — Depth above Top of Keel and Thickness.	Thick- ness of Side Girders	Margin Plate. — Depth (exclusive of Flange) and Thickness.	Thickness of Inner Bottom Plating.			Thick- ness of Brack't on Floor Plates.	DIMENSIONS OF ANGLE IRONS.		
				Middle Line Strake.	In En- gine and Boiler Space.	In Holds.		On Centre Girder.	On Margin Plates.	On Side Girders, In- termediate, and Vertical Angle Irons.
— under 11,000	$32 \times \frac{8}{16}$	$\frac{5}{16}$	$18 \times \frac{6}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$
11,000 and under 13,000	$33 \times \frac{8}{16}$	$\frac{6}{16}$	$19 \times \frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 2\frac{1}{2} \times \frac{6}{16}$
13,000 „ 15,000	$34 \times \frac{8}{16}$	$\frac{6}{16}$	$20 \times \frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$
15,000 „ 18,000	$35 \times \frac{9}{16}$	$\frac{6}{16}$	$21 \times \frac{7}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$
18,000 „ 21,000	$36 \times \frac{9}{16}$	$\frac{6}{16}$	$22 \times \frac{7}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$
21,000 „ 24,000	$38 \times \frac{10}{16}$	$\frac{6}{16}$	$24 \times \frac{7}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
24,000 „ 28,000	$40 \times \frac{10}{16}$	$\frac{7}{16}$	$26 \times \frac{7}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
28,000 „ 33,000	$42 \times \frac{10}{16}$	$\frac{7}{16}$	$28 \times \frac{8}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
33,000 „ 38,000	$44 \times \frac{10}{16}$	$\frac{7}{16}$	$30 \times \frac{8}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$

No. 2, White Lion Court, Cornhill, London, E.C.,

26th April, 1883.

THE HISTORY OF THE
CITY OF BOSTON

Year	Population	Area (sq. mi.)	Water (sq. mi.)	Land (sq. mi.)	Buildings	Ships	Trade	Notes
1630	100	1.0	0.5	0.5	10	1	Low	Founding of the city
1640	200	1.0	0.5	0.5	20	2	Low	First census
1650	300	1.0	0.5	0.5	30	3	Low	First census
1660	400	1.0	0.5	0.5	40	4	Low	First census
1670	500	1.0	0.5	0.5	50	5	Low	First census
1680	600	1.0	0.5	0.5	60	6	Low	First census
1690	700	1.0	0.5	0.5	70	7	Low	First census
1700	800	1.0	0.5	0.5	80	8	Low	First census
1710	900	1.0	0.5	0.5	90	9	Low	First census
1720	1000	1.0	0.5	0.5	100	10	Low	First census
1730	1100	1.0	0.5	0.5	110	11	Low	First census
1740	1200	1.0	0.5	0.5	120	12	Low	First census
1750	1300	1.0	0.5	0.5	130	13	Low	First census
1760	1400	1.0	0.5	0.5	140	14	Low	First census
1770	1500	1.0	0.5	0.5	150	15	Low	First census
1780	1600	1.0	0.5	0.5	160	16	Low	First census
1790	1700	1.0	0.5	0.5	170	17	Low	First census
1800	1800	1.0	0.5	0.5	180	18	Low	First census
1810	1900	1.0	0.5	0.5	190	19	Low	First census
1820	2000	1.0	0.5	0.5	200	20	Low	First census
1830	2100	1.0	0.5	0.5	210	21	Low	First census
1840	2200	1.0	0.5	0.5	220	22	Low	First census
1850	2300	1.0	0.5	0.5	230	23	Low	First census
1860	2400	1.0	0.5	0.5	240	24	Low	First census
1870	2500	1.0	0.5	0.5	250	25	Low	First census
1880	2600	1.0	0.5	0.5	260	26	Low	First census
1890	2700	1.0	0.5	0.5	270	27	Low	First census
1900	2800	1.0	0.5	0.5	280	28	Low	First census
1910	2900	1.0	0.5	0.5	290	29	Low	First census
1920	3000	1.0	0.5	0.5	300	30	Low	First census
1930	3100	1.0	0.5	0.5	310	31	Low	First census
1940	3200	1.0	0.5	0.5	320	32	Low	First census
1950	3300	1.0	0.5	0.5	330	33	Low	First census
1960	3400	1.0	0.5	0.5	340	34	Low	First census
1970	3500	1.0	0.5	0.5	350	35	Low	First census
1980	3600	1.0	0.5	0.5	360	36	Low	First census
1990	3700	1.0	0.5	0.5	370	37	Low	First census
2000	3800	1.0	0.5	0.5	380	38	Low	First census
2010	3900	1.0	0.5	0.5	390	39	Low	First census
2020	4000	1.0	0.5	0.5	400	40	Low	First census

TABLE G 7.
SUGGESTED SIZES AND SCANTLINGS FOR MASTS AND BOWSPRITS OF SAILING VESSELS AND FULL-RIGGED STEAM VESSELS.

IRON MASTS.														IRON BOWSPRITS.													
LENGTH.	PARTNERS.		HEEL.		HOUNDS.		HEAD.		SIZES OF ANGLE IRONS IN MASTS.	CHEEKS.		LENGTH OUTSIDE BED.	BED.		HEEL.		CAP.		SIZES OF ANGLE IRONS.								
	Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.		Thickness of Plate.	Sizes of Angle Iron.		Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.									
Two Plates in the Round.	48	17	$\frac{5}{16}$	13	$\frac{4}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	$11\frac{1}{2}$	$\frac{3}{16}$	...	$\frac{7}{16}$	$3\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	14	$17\frac{1}{2}$	$\frac{5}{16}$	$14\frac{1}{2}$	$\frac{5}{16}$	12	$\frac{4}{16}$	$2\frac{1}{2} \times 2 \times \frac{5}{16}$						
	51	18	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	14	$\frac{4}{16}$	12	$\frac{4}{16}$	...	$\frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	15	$18\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$	$12\frac{1}{2}$	$\frac{5}{16}$	$2\frac{1}{2} \times 2 \times \frac{5}{16}$						
	54	19	$\frac{5}{16}$	14	$\frac{4}{16}$	15	$\frac{4}{16}$	13	$\frac{4}{16}$	...	$\frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	16	20	$\frac{5}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	13	$\frac{5}{16}$	$3 \times 2 \times \frac{5}{16}$						
	57	20	$\frac{6}{16}$	15	$\frac{5}{16}$	16	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	...	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$	17	$21\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{6}{16}$	14	$\frac{5}{16}$	$3 \times 2 \times \frac{5}{16}$						
	60	21	$\frac{6}{16}$	16	$\frac{5}{16}$	17	$\frac{5}{16}$	14	$\frac{5}{16}$	...	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$	18	23	$\frac{6}{16}$	19	$\frac{6}{16}$	15	$\frac{5}{16}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$						
	63	22	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	18	$\frac{5}{16}$	15	$\frac{5}{16}$	...	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$	19	$24\frac{1}{2}$	$\frac{6}{16}$	20	$\frac{6}{16}$	16	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$						
Three Plates in the Round.	66	23	$\frac{6}{16}$	17	$\frac{5}{16}$	$18\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$	...	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	20	26	$\frac{7}{16}$	21	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$						
	69	$24\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{5}{16}$	19	$\frac{5}{16}$	16	$\frac{5}{16}$	...	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	21	27	$\frac{7}{16}$	22	$\frac{6}{16}$	$17\frac{1}{2}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$						
	72	26	$\frac{6}{16}$	19	$\frac{5}{16}$	20	$\frac{5}{16}$	17	$\frac{5}{16}$	...	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	22	28	$\frac{7}{16}$	23	$\frac{6}{16}$	$18\frac{1}{2}$	$\frac{6}{16}$	$4 \times 3 \times \frac{7}{16}$						
	75	27	$\frac{7}{16}$	$19\frac{1}{2}$	$\frac{6}{16}$	21	$\frac{6}{16}$	$17\frac{1}{2}$	$\frac{6}{16}$	...	$\frac{9}{16}$	$5 \times 3 \times \frac{8}{16}$	23	30	$\frac{8}{16}$	24	$\frac{7}{16}$	19	$\frac{6}{16}$	$4 \times 3\frac{1}{2} \times \frac{7}{16}$						
	78	28	$\frac{7}{16}$	20	$\frac{6}{16}$	22	$\frac{6}{16}$	18	$\frac{6}{16}$	...	$\frac{9}{16}$	$5 \times 3 \times \frac{9}{16}$	24	31	$\frac{8}{16}$	25	$\frac{7}{16}$	20	$\frac{6}{16}$	$4 \times 3\frac{1}{2} \times \frac{7}{16}$						
	81	29	$\frac{8}{16}$	21	$\frac{6}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	19	$\frac{6}{16}$	...	$\frac{9}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	25	32	$\frac{8}{16}$	26	$\frac{7}{16}$	21	$\frac{6}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$						
Four Plates in the Round.	84	30	$\frac{8}{16}$	22	$\frac{6}{16}$	23	$\frac{6}{16}$	$19\frac{1}{2}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$\frac{10}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	26	33	$\frac{8}{16}$	27	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$							
	87	31	$\frac{8}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	24	$\frac{6}{16}$	20	$\frac{6}{16}$	$4 \times 3 \times \frac{7}{16}$	$\frac{10}{16}$	$5\frac{1}{2} \times 4 \times \frac{10}{16}$	27	35	$\frac{8}{16}$	28	$\frac{7}{16}$	22	$\frac{6}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$							
	90	32	$\frac{8}{16}$	23	$\frac{7}{16}$	25	$\frac{7}{16}$	21	$\frac{6}{16}$	$4 \times 3 \times \frac{7}{16}$	$\frac{10}{16}$	$6 \times 4 \times \frac{10}{16}$															
	93	33	$\frac{9}{16}$	24	$\frac{7}{16}$	26	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$	$4 \times 3 \times \frac{8}{16}$	$\frac{11}{16}$	$6 \times 4 \times \frac{10}{16}$															
	96	34	$\frac{9}{16}$	25	$\frac{7}{16}$	$26\frac{1}{2}$	$\frac{7}{16}$	22	$\frac{6}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	$\frac{11}{16}$	$6 \times 4 \times \frac{10}{16}$															

SUGGESTIONS FOR THE CONSTRUCTION OF IRON MASTS, BOWSPRITS, AND YARDS.—The Iron used in the construction of masts, bowsprits, and yards, should be of a good malleable quality and quite free from surface or other defects. The iron should stand a tensile strain of 20 tons to the square inch, and should be capable of standing the following bending tests when cold without fracture:—

THICKNESS OF PLATES.	TO BEND COLD THROUGH AN ANGLE OF	
	With the Grain.	Across the Grain.
$\frac{9}{16}$	25°	8°
$\frac{8}{16}$	30°	11°
$\frac{7}{16}$	37°	13°
$\frac{6}{16}$	47°	15°
$\frac{5}{16}$	55°	17°
$\frac{4}{16}$	65°	20°
$\frac{3}{16}$	70°	25°

The plates to be bent over a slab, the corner of which should be rounded with a radius of half an inch.

LOWER MASTS.—The plating should be of the thickness, and the plates arranged as suggested in the Table. The seams should be double riveted. The butts below the mast partners in masts, and those inside the wedging of bowsprits, might be double riveted, the remainder should be treble riveted. The butt straps in all cases should be $\frac{1}{8}$ of an inch thicker than the plates they connect, and would be better to be fitted on the outside of the masts and bowsprit. The mast and bowsprit plates should be doubled in way of the wedging, or otherwise efficiently strengthened. The heels of all masts and their steps should be efficiently strengthened. The cheeks of masts should be stiffened by angle irons or cope iron on their foremost edges; or by some other approved plan.

Where two plates in the round are allowed instead of three, the iron should be of such superior quality as to admit of its being bent to the required form, without being unduly heated, to a fair curve and without fracture, and in all such cases the masts should be stiffened by three angle-irons as provided for in the Suggested Tables.

All masts of 84 feet length and above, to be fitted with angle irons properly shifted and extending the whole length of the mast. If the plates be arranged as described in the Tables, there should be an angle iron fitted to each plate in the round, of the size given in the Table.

All bowsprits exceeding 28 inches in diameter should have a vertical diaphragm plate extending from within the wedging to the gammoning, connected by continuous single angle irons to the upper and lower parts of the bowsprit, and two additional angle irons of the size given in the Table; and bowsprits 28 inches in diameter and under, to have an angle iron at the centre of each plate extending the whole length of the bowsprit.

Sketches of steel masts, bowsprits, and yards to be submitted for the approval of the Committee.

The attention of the Surveyors is to be especially directed to the fittings connected with the masts and rigging, in order to ensure the workmanship, material, and sizes of the same being efficient.

Where a Steamer is intended to be fitted with masts or a bowsprit for auxiliary purposes, they may be one-eighth less in diameter than prescribed by Table.

The mizenmasts for barques may be reduced one-fifth in diameter from that given in the Table, and the plating to be not less than the thickness corresponding to the diameters.

THE HISTORY OF THE
CITY OF BOSTON

Year	Population	Area (sq. mi.)	Water (sq. mi.)	Land (sq. mi.)	Buildings	Ships	Trade	Notes
1630	100	1.0	0.5	0.5	10	1	Low	Founding of the city
1640	200	1.0	0.5	0.5	20	2	Low	First census
1650	300	1.0	0.5	0.5	30	3	Low	First census
1660	400	1.0	0.5	0.5	40	4	Low	First census
1670	500	1.0	0.5	0.5	50	5	Low	First census
1680	600	1.0	0.5	0.5	60	6	Low	First census
1690	700	1.0	0.5	0.5	70	7	Low	First census
1700	800	1.0	0.5	0.5	80	8	Low	First census
1710	900	1.0	0.5	0.5	90	9	Low	First census
1720	1000	1.0	0.5	0.5	100	10	Low	First census
1730	1100	1.0	0.5	0.5	110	11	Low	First census
1740	1200	1.0	0.5	0.5	120	12	Low	First census
1750	1300	1.0	0.5	0.5	130	13	Low	First census
1760	1400	1.0	0.5	0.5	140	14	Low	First census
1770	1500	1.0	0.5	0.5	150	15	Low	First census
1780	1600	1.0	0.5	0.5	160	16	Low	First census
1790	1700	1.0	0.5	0.5	170	17	Low	First census
1800	1800	1.0	0.5	0.5	180	18	Low	First census
1810	1900	1.0	0.5	0.5	190	19	Low	First census
1820	2000	1.0	0.5	0.5	200	20	Low	First census
1830	2100	1.0	0.5	0.5	210	21	Low	First census
1840	2200	1.0	0.5	0.5	220	22	Low	First census
1850	2300	1.0	0.5	0.5	230	23	Low	First census
1860	2400	1.0	0.5	0.5	240	24	Low	First census
1870	2500	1.0	0.5	0.5	250	25	Low	First census
1880	2600	1.0	0.5	0.5	260	26	Low	First census
1890	2700	1.0	0.5	0.5	270	27	Low	First census
1900	2800	1.0	0.5	0.5	280	28	Low	First census
1910	2900	1.0	0.5	0.5	290	29	Low	First census
1920	3000	1.0	0.5	0.5	300	30	Low	First census
1930	3100	1.0	0.5	0.5	310	31	Low	First census
1940	3200	1.0	0.5	0.5	320	32	Low	First census
1950	3300	1.0	0.5	0.5	330	33	Low	First census
1960	3400	1.0	0.5	0.5	340	34	Low	First census
1970	3500	1.0	0.5	0.5	350	35	Low	First census
1980	3600	1.0	0.5	0.5	360	36	Low	First census
1990	3700	1.0	0.5	0.5	370	37	Low	First census
2000	3800	1.0	0.5	0.5	380	38	Low	First census
2010	3900	1.0	0.5	0.5	390	39	Low	First census
2020	4000	1.0	0.5	0.5	400	40	Low	First census

TABLE G 8.

SUGGESTED SIZES AND SCANTLINGS FOR YARDS AND TOPMASTS OF SAILING VESSELS AND
FULL RIGGED STEAM VESSELS.

IRON YARDS.											IRON TOPMASTS.						
LENGTH.	CENTRE.		1st Quarter.		2nd Quarter.		3rd Quarter.		ENDS.		LENGTH.	HEEL.		Lower Part of Head.		HEAD.	
	Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.	Diameter.	Thickness.		Diameter.	Thickness.	Diameter.	Thickness.		
32	8	$\frac{3}{16}$	$7\frac{7}{8}$	$\frac{3}{16}$	$7\frac{1}{4}$	$\frac{3}{16}$	6	$\frac{3}{16}$	4	$\frac{2}{16}$	32	$11\frac{1}{2}$	$\frac{3}{16}$	$7\frac{1}{4}$	$\frac{3}{16}$	$6\frac{1}{2}$	$\frac{2}{16}$
36	9	$\frac{3}{16}$	$8\frac{3}{4}$	$\frac{3}{16}$	$8\frac{1}{8}$	$\frac{3}{16}$	$6\frac{3}{4}$	$\frac{3}{16}$	$4\frac{1}{2}$	$\frac{2}{16}$	34	12	$\frac{3}{16}$	8	$\frac{3}{16}$	7	$\frac{2}{16}$
40	10	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	9	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{3}{16}$	5	$\frac{2}{16}$	36	$12\frac{1}{2}$	$\frac{4}{16}$	9	$\frac{4}{16}$	$7\frac{1}{2}$	$\frac{3}{16}$
44	11	$\frac{3}{16}$	$10\frac{3}{4}$	$\frac{3}{16}$	10	$\frac{3}{16}$	$8\frac{1}{4}$	$\frac{3}{16}$	$5\frac{1}{2}$	$\frac{2}{16}$	38	$13\frac{1}{2}$	$\frac{4}{16}$	10	$\frac{4}{16}$	8	$\frac{3}{16}$
48	12	$\frac{4}{16}$	$11\frac{3}{4}$	$\frac{4}{16}$	$10\frac{3}{4}$	$\frac{3}{16}$	9	$\frac{3}{16}$	6	$\frac{2}{16}$	40	$14\frac{1}{2}$	$\frac{4}{16}$	11	$\frac{4}{16}$	9	$\frac{3}{16}$
52	13	$\frac{4}{16}$	$12\frac{5}{8}$	$\frac{4}{16}$	$11\frac{3}{4}$	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	$6\frac{1}{2}$	$\frac{2}{16}$	42	15	$\frac{4}{16}$	$11\frac{1}{2}$	$\frac{4}{16}$	$9\frac{1}{2}$	$\frac{3}{16}$
56	14	$\frac{4}{16}$	$13\frac{5}{8}$	$\frac{4}{16}$	$12\frac{5}{8}$	$\frac{4}{16}$	$10\frac{1}{2}$	$\frac{3}{16}$	7	$\frac{2}{16}$	44	$15\frac{1}{2}$	$\frac{4}{16}$	12	$\frac{4}{16}$	$10\frac{1}{2}$	$\frac{3}{16}$
60	15	$\frac{4}{16}$	$14\frac{5}{8}$	$\frac{4}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	$11\frac{1}{4}$	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{2}{16}$	46	16	$\frac{5}{16}$	13	$\frac{4}{16}$	11	$\frac{4}{16}$
64	16	$\frac{5}{16}$	$15\frac{5}{8}$	$\frac{5}{16}$	$14\frac{3}{8}$	$\frac{5}{16}$	12	$\frac{4}{16}$	8	$\frac{3}{16}$	48	17	$\frac{5}{16}$	14	$\frac{4}{16}$	$11\frac{1}{2}$	$\frac{4}{16}$
68	17	$\frac{5}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{4}$	$\frac{5}{16}$	$12\frac{3}{4}$	$\frac{4}{16}$	$8\frac{1}{2}$	$\frac{3}{16}$	50	$17\frac{1}{2}$	$\frac{5}{16}$	15	$\frac{4}{16}$	$12\frac{1}{2}$	$\frac{4}{16}$
72	18	$\frac{5}{16}$	$17\frac{1}{2}$	$\frac{5}{16}$	$16\frac{1}{4}$	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	9	$\frac{3}{16}$	52	18	$\frac{6}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$	13	$\frac{5}{16}$
76	19	$\frac{6}{16}$	$18\frac{1}{2}$	$\frac{5}{16}$	$17\frac{1}{8}$	$\frac{5}{16}$	$14\frac{1}{4}$	$\frac{4}{16}$	$9\frac{1}{2}$	$\frac{3}{16}$	54	$18\frac{1}{2}$	$\frac{6}{16}$	16	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{5}{16}$
80	20	$\frac{6}{16}$	$19\frac{1}{2}$	$\frac{5}{16}$	18	$\frac{5}{16}$	15	$\frac{4}{16}$	10	$\frac{3}{16}$	56	$19\frac{1}{2}$	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	14	$\frac{5}{16}$
84	21	$\frac{7}{16}$	$20\frac{1}{2}$	$\frac{6}{16}$	19	$\frac{5}{16}$	$15\frac{3}{4}$	$\frac{5}{16}$	$10\frac{1}{2}$	$\frac{4}{16}$	58	20	$\frac{6}{16}$	17	$\frac{5}{16}$	15	$\frac{5}{16}$
88	22	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$	$19\frac{3}{4}$	$\frac{5}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	11	$\frac{4}{16}$	60	$20\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{5}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$
92	23	$\frac{7}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	$20\frac{3}{4}$	$\frac{6}{16}$	$17\frac{1}{4}$	$\frac{5}{16}$	$11\frac{1}{2}$	$\frac{4}{16}$	62	$21\frac{1}{2}$	$\frac{6}{16}$	$18\frac{1}{2}$	$\frac{5}{16}$	16	$\frac{5}{16}$
96	24	$\frac{7}{16}$	$23\frac{3}{8}$	$\frac{6}{16}$	$21\frac{5}{8}$	$\frac{6}{16}$	18	$\frac{5}{16}$	12	$\frac{4}{16}$	64	22	$\frac{6}{16}$	$19\frac{1}{2}$	$\frac{5}{16}$	17	$\frac{5}{16}$

TOPMASTS.—The plating should be of the thickness given in the Table. The seams of topmasts may be single riveted; the butts should be treble riveted, and their straps $\frac{1}{8}$ of an inch thicker than the plates they connect. There should be doubling plates in the way of the lower mast cap. Topmasts should be efficiently strengthened in the way of the fid holes and in the way of sheave holes where such are cut, by the doubling plates, iron hoops, or by other approved methods.

LOWER YARDS.—The plating should be of the thickness given in the Table. The seams of yards may be single riveted; their butts should be treble riveted, and connected by being overlapped, or by efficient butt straps. The plates should be doubled at the centre, and the doubling plates should extend beyond the truss hoops.

Where iron masts and yards are to be constructed otherwise than in accordance with the Tables plans and particulars of the same must be submitted for the approval of the Committee.

Where Steamers are intended to be fitted with topmasts for auxiliary purposes, they might be one-eighth less in diameter than prescribed by Table.

TABLE G 8.

SUGGESTED SIZES AND SCANTLING FOR YARDS AND TOPMASTS OF SAILING VESSELS.
FULL RIGGED STEAM VESSELS.

Masts	IRON YARDS						IRON TOPMASTS	
	Centre.	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	End of Mast.	1st Quarter.	2nd Quarter.
32	8	7½	7½	7½	7½	7½	8	7½
36	9	8½	8½	8½	8½	8½	9	8½
40	10	9½	9½	9½	9½	9½	10	9½
44	11	10½	10½	10½	10½	10½	11	10½
48	12	11½	11½	11½	11½	11½	12	11½
52	13	12½	12½	12½	12½	12½	13	12½
56	14	13½	13½	13½	13½	13½	14	13½
60	15	14½	14½	14½	14½	14½	15	14½
64	16	15½	15½	15½	15½	15½	16	15½
68	17	16½	16½	16½	16½	16½	17	16½
72	18	17½	17½	17½	17½	17½	18	17½
76	19	18½	18½	18½	18½	18½	19	18½
80	20	19½	19½	19½	19½	19½	20	19½
84	21	20½	20½	20½	20½	20½	21	20½
88	22	21½	21½	21½	21½	21½	22	21½
92	23	22½	22½	22½	22½	22½	23	22½
96	24	23½	23½	23½	23½	23½	24	23½

Lodge's Register of British and Foreign Shipping, 2, White Star Court, London.

SUGGESTED TABLE OF SIZES FOR THE IRON WIRE STANDING RIGGING, &c., OF SAILING SHIPS.

REGISTER TONNAGE UNDER DECK.	Tons.		Tons.		Tons.		Tons.		Tons.		Tons.		Tons.		Tons.		Tons.		Tons.		Tons.	
	1,800		1,600		1,400		1,200		1,000		800		700		600		500		400		300	
	to 2,000.		to 1,800.		to 1,600.		to 1,400.		to 1,200.		to 1,000.		to 800.		to 700.		to 600.		to 500.		to 400.	
	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.	No.	Size. Inches.
FORE & MAIN Shrouds ...	6	5½	6	5¼	6	5	6	4¾	6	4½	5	4¼	5	4	5	3¾	5	3½	4	3¼	4	3
„ „ Chain plates	and cap	2¼	and cap	2⅛	and cap	2	and cap	1⅞	and cap	1¾	and cap	1¾	and cap	1⅝	and cap	1⅝		1½		1½		1½
„ „ Dead-eyes ...	12	7	11½	6½	11	6	10½	6	10	6	9½	5½	9	5½	8½	5	8	5	7½	4½	7	4½
„ „ Lanyards (hemp)	6		5¾		5½		5¼		5		4¾		4½		4¼		4		3¾		3½	
„ „ Topmst. bckstys.	3	5½	3	5¼	3	5	3	4¾	3	4½	2	4¼	2	4	2	3¾	2	3½	2	3¼	2	3
„ „ Top-gllt. bckstys.	2	4	2	3¾	2	3½	2	3¼	2	3⅛	2	3	2	2¾	2	2⅝	2	2½	2	2¼	2	2
„ „ Lower stays ...	2	5½	2	5¼	2	5	2	4¾	2	4½	2	4¼	2	4	2	3¾	2	3½	2	3¼	2	3
„ „ Topmast stays	2	5½	2	5¼	2	5	2	4¾	2	4½	2	4¼	2	4	2	3¾	2	3½	2	3¼	2	3
„ „ Top-gallant stays	4		3¾		3½		3¼		3⅛		3		2¾		2⅝		2½		2¼		2	
MIZEN Shrouds ...	5	4½	5	4¼	5	4	5	3¾	5	3½	5	3⅝	5	3¼	4	3⅛	4	3	3	2⅞	3	2¾
„ Topmast backstays ...	and cap	3	and cap	4½	and cap	3	and cap	4¼	and cap	3	and cap	4¼	and cap	3	and cap	4¼		3		2⅞		2¾
„ Top-gallant backstays	2	3¼	2	3	2	2¾	2	2½	2	2¼	2	2⅛	2	2	2	1¾	2	1¾	2	1½	2	1½
„ Lower stays ...	2	4½	2	4¼	2	4	2	3¾	2	3½	2	3⅝	2	3¼	2	3⅛	2	3	2	2⅞	2	2¾
„ Topmast stays	2	4½	2	4¼	2	4	2	3¾	2	3½	2	3⅝	2	3¼	2	3⅛	2	3	2	2⅞	2	2¾
„ Top-gallant stays	3¼		3		2¾		2½		2¼		2⅛		2		1¾		1¾		1½		1½	
BOBSTAY Bar ...	3¾		3⅝		3½		3¼		3		2½		2¼		2		2		2		2	
„ Pin ...	2¾		2⅝		2½		2¼		2⅛		1⅞		1⅞		1½		1½		1½		1½	
„ Chain ...	1¼		1⅓		1¼		1¼		1¼		1¼		1¼		1¼		1¼		1¼		1¼	
BOWSPRIT Shrouds ...	2	1	2	1	2	7/8	2	7/8	2	13/16	2	13/16	2	13/16	2	13/16	2	13/16	2	13/16	2	13/16

1.—The above requirements are intended to apply to vessels in which the dimensions of the masts and yards are such as would not be deemed unusual for vessels of the respective tonnages; where these dimensions are extreme, or where four masts are adopted instead of three, or in other exceptional cases where deviations from the above sizes are required, rigging plans showing the sizes and arrangements of the several parts should be submitted for the approval of the Committee.

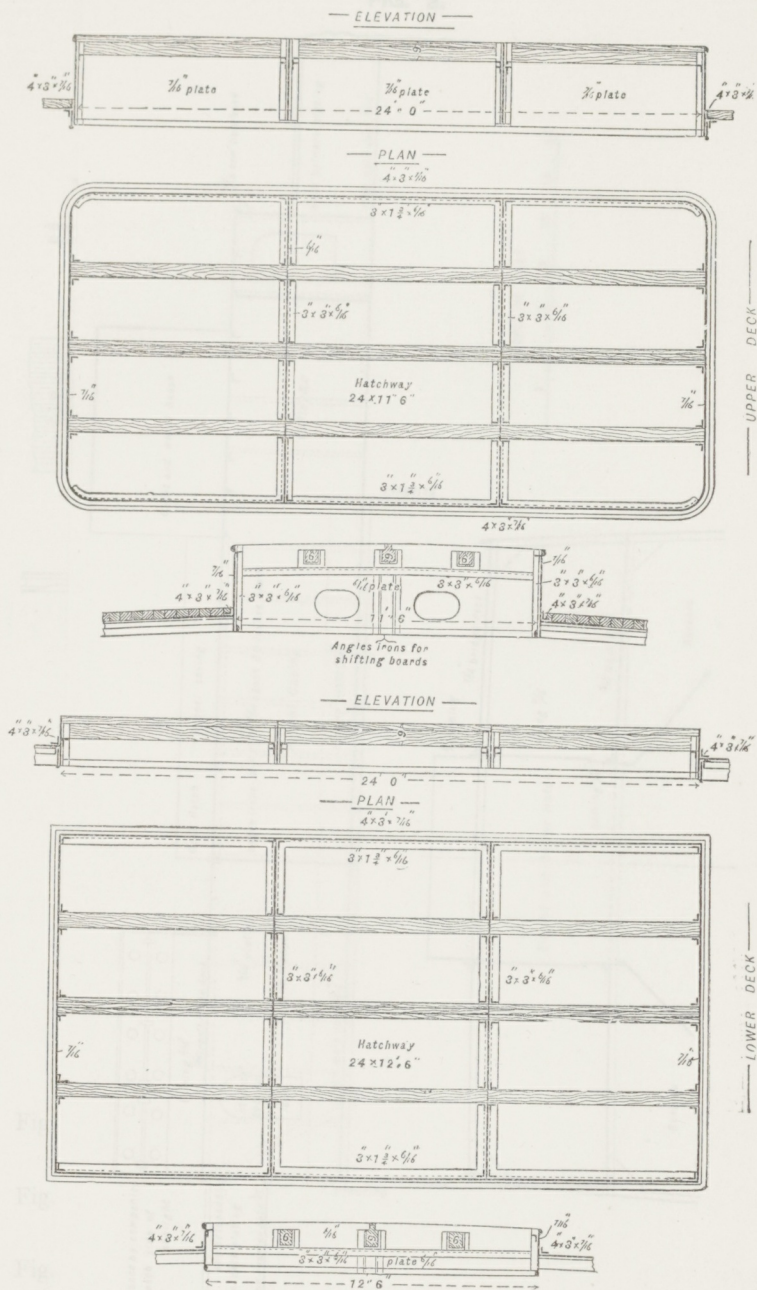
2.—Where screws are fitted for the purpose of setting up the shrouds and backstays, a sketch of the same showing the dimensions of the several parts is to be submitted.

3.—Where it is proposed to adopt steel wire rigging, the following sizes are suggested in lieu of iron wire ropes for the same parts:—

	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Iron ..	5½	5¼	5	4¾	4½	4¼	4	3¾	3½	3¼	3
Steel ..	4¾	4½	4¼	4⅓	4	3¾	3½	3¼	3	2¾	2½

But in each case application must be made in the first place for the approval of the Committee, stating particulars of the manufacture and quality of the steel wire ropes proposed, and the tests which they are guaranteed to withstand.

4.—Where double top-gallant yards are to be adopted, a topmast cap backstay should be fitted.



Sketch showing arrangement of Shifting Beams in Cargo Hatchways.

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CITY OF BOSTON

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1650	300	1.0	0.5	0.5	30	3	Low	First census
1660	400	1.0	0.5	0.5	40	4	Low	First census
1670	500	1.0	0.5	0.5	50	5	Low	First census
1680	600	1.0	0.5	0.5	60	6	Low	First census
1690	700	1.0	0.5	0.5	70	7	Low	First census
1700	800	1.0	0.5	0.5	80	8	Low	First census
1710	900	1.0	0.5	0.5	90	9	Low	First census
1720	1000	1.0	0.5	0.5	100	10	Low	First census
1730	1100	1.0	0.5	0.5	110	11	Low	First census
1740	1200	1.0	0.5	0.5	120	12	Low	First census
1750	1300	1.0	0.5	0.5	130	13	Low	First census
1760	1400	1.0	0.5	0.5	140	14	Low	First census
1770	1500	1.0	0.5	0.5	150	15	Low	First census
1780	1600	1.0	0.5	0.5	160	16	Low	First census
1790	1700	1.0	0.5	0.5	170	17	Low	First census
1800	1800	1.0	0.5	0.5	180	18	Low	First census
1810	1900	1.0	0.5	0.5	190	19	Low	First census
1820	2000	1.0	0.5	0.5	200	20	Low	First census
1830	2100	1.0	0.5	0.5	210	21	Low	First census
1840	2200	1.0	0.5	0.5	220	22	Low	First census
1850	2300	1.0	0.5	0.5	230	23	Low	First census
1860	2400	1.0	0.5	0.5	240	24	Low	First census
1870	2500	1.0	0.5	0.5	250	25	Low	First census
1880	2600	1.0	0.5	0.5	260	26	Low	First census
1890	2700	1.0	0.5	0.5	270	27	Low	First census
1900	2800	1.0	0.5	0.5	280	28	Low	First census
1910	2900	1.0	0.5	0.5	290	29	Low	First census
1920	3000	1.0	0.5	0.5	300	30	Low	First census
1930	3100	1.0	0.5	0.5	310	31	Low	First census
1940	3200	1.0	0.5	0.5	320	32	Low	First census
1950	3300	1.0	0.5	0.5	330	33	Low	First census
1960	3400	1.0	0.5	0.5	340	34	Low	First census
1970	3500	1.0	0.5	0.5	350	35	Low	First census
1980	3600	1.0	0.5	0.5	360	36	Low	First census
1990	3700	1.0	0.5	0.5	370	37	Low	First census
2000	3800	1.0	0.5	0.5	380	38	Low	First census
2010	3900	1.0	0.5	0.5	390	39	Low	First census
2020	4000	1.0	0.5	0.5	400	40	Low	First census

FIG. 1.

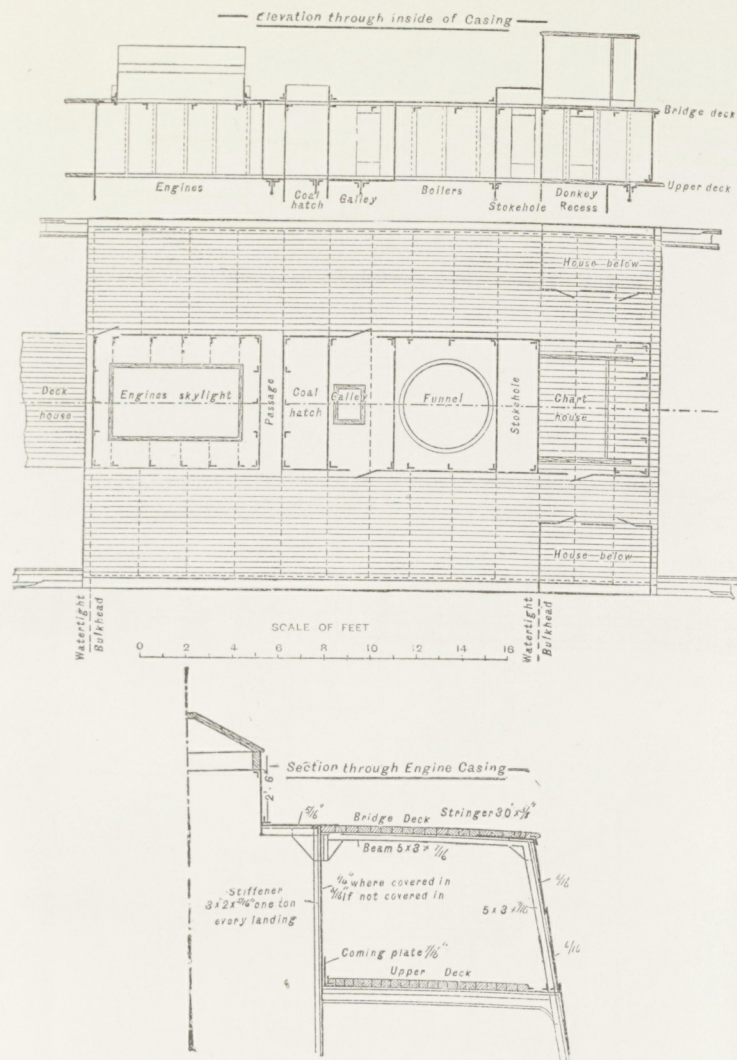


FIG. 2.

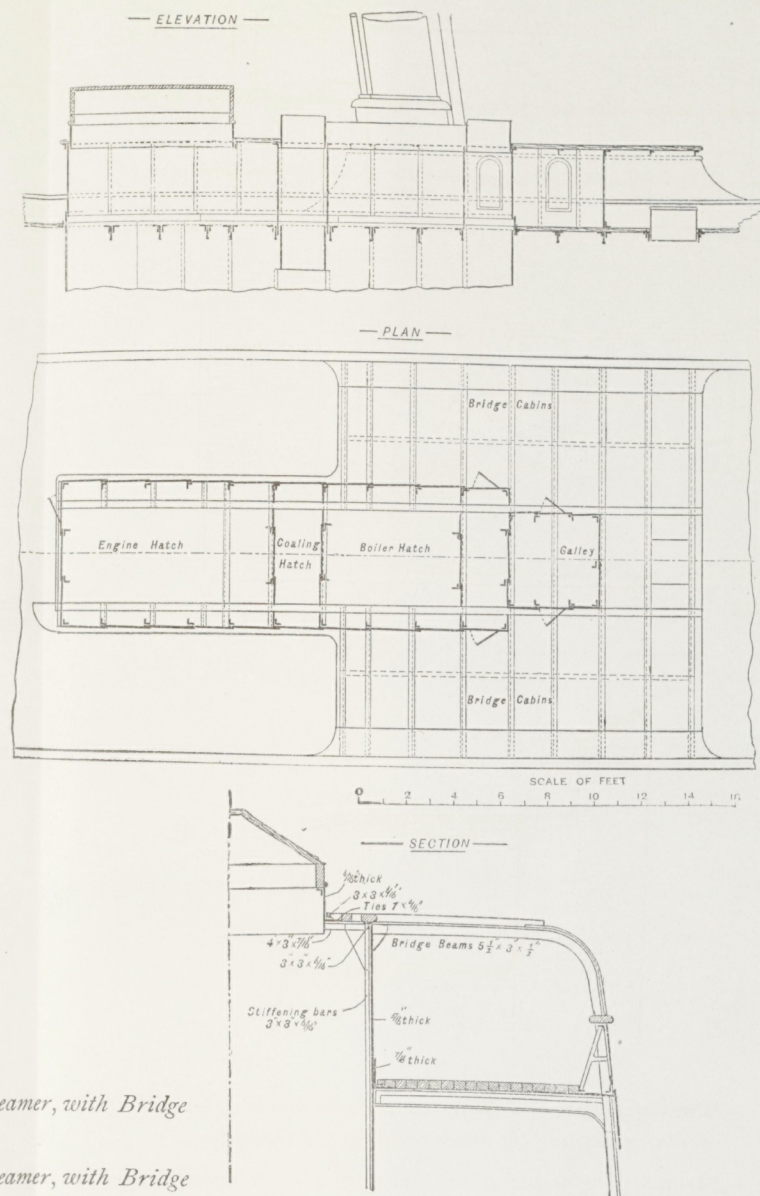


FIG. 3.

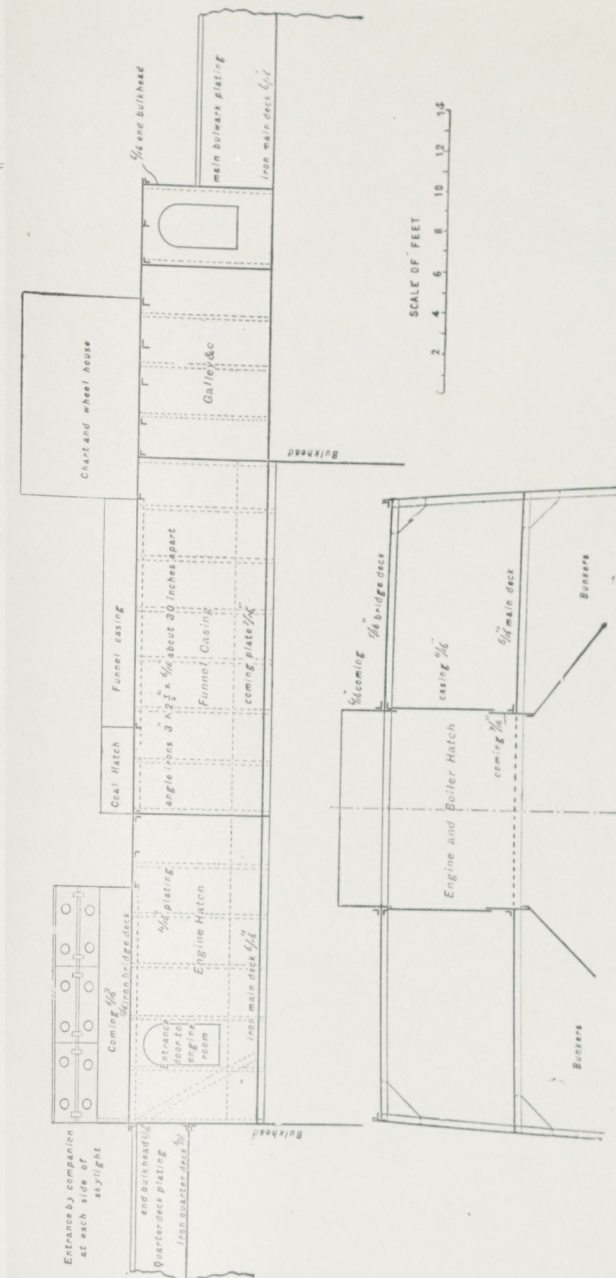


Fig. 1.—Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck extending the whole length of the Openings.

Fig. 2.—Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck covering the Boiler Hatchway.

Fig. 3.—Sketch of Engine and Boiler Casings in a Vessel with a Long Raised Quarter Deck and Enclosed Bridge House.

LLOYD'S REGISTER
OF
BRITISH AND FOREIGN SHIPPING.

R U L E S

FOR

THE BUILDING & CLASSIFICATION OF SHIPS BUILT OF WOOD.

RULES FOR THE BUILDING AND CLASSIFICATION OF SHIPS BUILT OF WOOD.

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RULES FOR WOOD SHOPS

11

ARTICLE I

Section 1. The purpose of this shop is to provide a place where the members of the shop may meet and discuss the problems of the shop and the problems of the community in general.

ARTICLE II

Section 1. The shop shall be open to all members of the shop.

ARTICLE III

Section 1. The shop shall be open to all members of the shop.

ARTICLE IV

Section 1. The shop shall be open to all members of the shop.

ARTICLE V

Section 1. The shop shall be open to all members of the shop.

ARTICLE VI

Section 1. The shop shall be open to all members of the shop.

Section 2. The shop shall be open to all members of the shop.

ARTICLE VII

Section 1. The shop shall be open to all members of the shop.

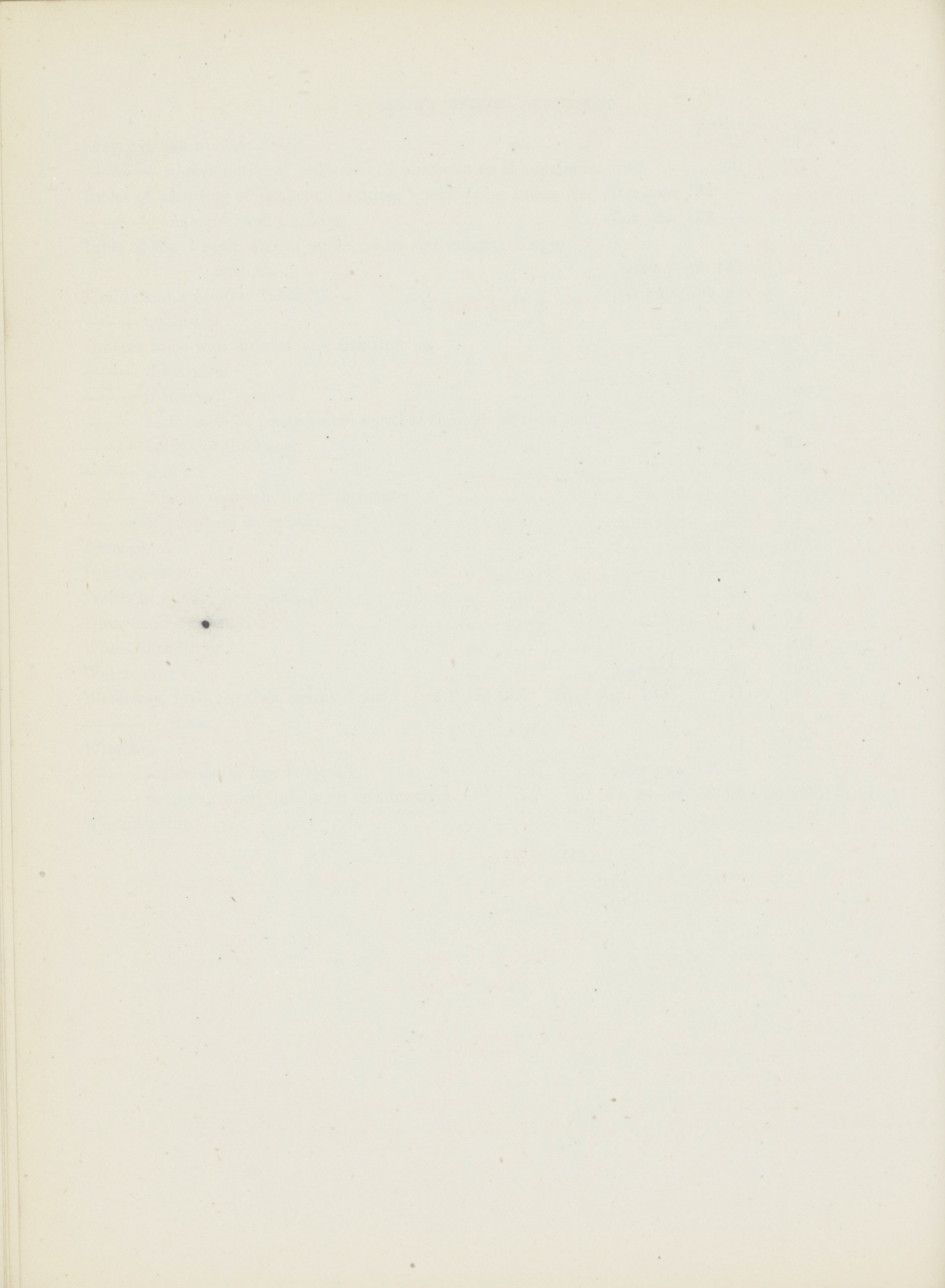
ARTICLE VIII

Section 1. The shop shall be open to all members of the shop.

Section 2. The shop shall be open to all members of the shop.

Section 3. The shop shall be open to all members of the shop.

Section 4. The shop shall be open to all members of the shop.



CHARACTERS.

Section 31. 1. The characters assigned to ships to be, as nearly as possible, a correct indication of their real and intrinsic qualities,* and to be in all cases fixed (not by the Surveyors, but) by the Committee, after due consideration of the reports of the Surveyors, and such other documents as may be submitted to them, and will be distinguished as follows:—

SHIPS CLASSED A.

2. To consist of new ships, or ships Continued, or Restored. (*Vide* Sections 34, and 54 to 59.)

SHIPS CLASSED A, in Red.

3. To consist of ships which have passed the period assigned on the original Survey, or Continuation, or Restoration, and of ships not having had an original character, provided they are found on survey of superior description, fit for the conveyance of dry and perishable goods, *to and from all parts of the world.* (*Vide* Section 60.)

SHIPS CLASSED Æ.

4. To consist of ships which are found on Survey fit for the safe conveyance of dry and perishable goods, on *shorter voyages*, and for the conveyance of cargoes not in their nature subject to sea damage on *any voyage.* (*Vide* Section 61.)

SHIPS CLASSED E.

5. Will comprise ships which shall be found on Survey fit for the conveyance of cargoes not in their nature subject to sea damage *on any voyage.* (*Vide* Section 64.)

FOREIGN BUILT SHIPS CLASSED F.†

6. Foreign Built Ships which have not been constructed in accordance with the Rules, and have not been surveyed by the Surveyors to this Society while building, have, upon survey, been assigned one of the two following designations of condition or character, thus, 1 F,—2 F, if found eligible thereto. (*See* Section 83.)

7. It is to be distinctly understood that the following characters are confined in their application to *Foreign Built Ships.*

SHIPS CLASSED 1 F.

8. 1 F denotes ships which have been found on survey to be of a superior description, fit for the conveyance of dry and perishable goods to and from all parts of the world.

SHIPS CLASSED 2 F.

9. 2 F denotes ships which, although not equal to the foregoing, have nevertheless been found on survey to be in a good and efficient condition, and fit for the conveyance of dry and perishable goods, on *shorter voyages.*

* Ships which are not built in accordance with the principles of the Society's Rules will be marked in the Register Book thus "[*Expl. B.S.*]," denoting that they are built experimentally, and are classed subject to being surveyed biennially.

† Mem. 1st July, 1876:—*The Character F will not in future be assigned in the Classification of Ships.*

These Ships, however, which have already been assigned this Character will be allowed to retain the same upon Periodical Survey in accordance with the requirements of Section 83 of the Rules. Owners of Ships so classed are, at the same time, invited to submit their Vessels for Classification with some other Character provided for in the Rules.

10. To entitle sailing ships to the Figure 1 for equipment, Sections 72 to 76 must be conformed to and stores supplied in accordance with Table 22, attached to the Rules.

11. For steam vessels *see* Sections 76 to 78, 81, and 82.

EXPUNGING OR WITHDRAWAL OF CHARACTER.

12. The twelfth, thirteenth, and fourteenth Columns of the page of the Register Book left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots (...) in Column 13 indicate that the Vessel was at one time Classed by this Society, but that the Class has been withdrawn at Owner's request. A black line with date under it in Column 14 indicates that, at that date, the Vessel, from reported defects, was not entitled to a Character in the Register Book. A red line with date under it in this Column indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.

TONNAGE FOR REGULATING THE SCANTLINGS AND EQUIPMENT (AS REGARDS ANCHORS, CHAINS, &c.) OF WOOD VESSELS.

Section 32. 1. In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

2. In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, an awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

3. But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then the difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

RULES FOR CLASSIFICATION.

SHIPS CLASSED A.

Section 33. 1. Will consist of new ships, and ships which have not passed a prescribed age, and also those which have a Continuation or Restoration of that character, provided they are kept in a state of complete repair and efficiency.

2. The Character A will not be granted to any vessel unless satisfactory evidence of the date, build, and place where built, is produced. (*See* Section 59, *foot-note*.)

Section 34. 1. The number of years to be assigned for Character A is to be determined with reference to the original construction and quality of the vessels, the materials employed, and the mode of building; and their continuance for the time so assigned to depend upon its being shown by occasional surveys (annually, if practicable) that their efficiency is duly maintained. (*See* N.B. at foot.)

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

2. Defects in workmanship or quality of timber will involve a reduction of class, to be determined by the Committee in each case.

HALF-TIME OR INTERMEDIATE SURVEY.*

3. The Characters of ships classed A, or A in Red, will be struck out of the Register Book unless they be submitted to the following intermediate survey, within periods not exceeding four years in the case of vessels classed from six to eight years inclusive, either originally, or on Continuation, or on Restoration, or A in Red, and within periods not exceeding half that assigned in vessels classed for longer terms. Vessels classed for a less period than the above will not be required to undergo such half-time survey.

4. The survey will be noted in the Register Book thus,—“H.T.” (half-time), with the date of the survey affixed.

SURVEY.

5. The ship to be placed on blocks in dry dock, or on ways, so that the keel and bottom may be seen and properly examined (unless she has been thus surveyed by the Society's officers within the previous twelve months); the hold to be cleared, and proper stages made both inside and outside; the limbers, and all air courses to be cleared; and if the ship has not already got the air courses, described in Section 37 of the Rules, they are now to be made; the outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defect; bolts of lower deck (if of iron) in number not less than six on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship.

6. The attention of the Surveyors is to be then particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, *whether of iron or copper*, and the outside planks through which they pass, and to all other parts of the ship, so far as they can be examined.

7. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

8. The windlass to be unhung and its wood lining sufficiently stripped for examination; the condition of the caulking is also to be ascertained.

9. The cables to be removed from the lockers and ranged, and, with the anchors, masts, spars, and general equipment, examined so as to be satisfactorily reported upon.

10. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout such vessels is to be ascertained and reported upon at the Half-time Survey, and, if necessary, the salt is to be renewed. (*See Section 37 as regards beams not salted.*)

SHIPS BUILT WITH MIXED TIMBER MATERIALS.

11. Ships built with Mixed Timber Materials below the fourteen years' grade, of superior workmanship, and in which *high* class materials and extra fastenings have been judiciously employed to such an extent as to satisfy the Committee, may be allowed a period of original designation exceeding that to which the material of the lowest class used would otherwise entitle them, such additional period not to exceed two years.

* For Composite Ships, see Section 43 of the Rule for Composite Ships.

12. Builders seeking this advantage must, in the first instance, submit, for the Committee's approval, a drawing of the midship section, with full details of construction and of the proposed materials and scantlings, through the resident Surveyor, who is to state to the Committee his opinion thereon, and the ship must be built under special survey.

13. No vessel already built, however, can have the advantage of the above rule, except a Special Survey be held on her to determine her claims thereto.

14. The highest (unless of a very limited quantity) and the lowest grade timber materials used in the construction of such Ships will be inserted in the Register Book.

See Sections 57 and 58 as regards application of this Rule to ships surveyed for Restoration.

SURVEYS WHILE BUILDING.

SPECIAL SURVEY.*

Section 35. 1. The Surveyors are to examine, during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

2. In Steam Vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

NOT UNDER SPECIAL SURVEY.

3. New ships not building under Special Survey are to be surveyed by the Surveyors to this Society, in the following three stages of their progress, or they will be liable to lose one year of the period to which they might otherwise be entitled. (*See Section 53.*)

First.—When the Frame is completed, timbers dubbed fair inside and outside ready to receive planking and before any planking is wrought.

Second.—When the Beams are put in, but before the Decks are laid, and with at least two strakes of the plank of the ceiling between the lower deck and the bilge unwrought, to admit of an examination of the inner surface of the plank of the bottom.

Third.—When the Hull is completed, and before the plank is painted or payed.

4. All Ships for which a higher character than Ten Years A may be claimed, must be surveyed by an exclusive Officer of the Society, twice at least while building—namely, at the first and at the second stage of their progress as above prescribed. Due notice must be given by the Builder or Owner of their being ready for these surveys.

Section 36. A full statement of the dimensions, scantlings, &c., of all New Ships, verified by the Builder, is to be transmitted by the Surveyor, on a Form similar to No. 1 (*vide* page 153), which is to be kept as a record in the office of the Society.

RULES TO BE OBSERVED IN BUILDING SHIPS.

Section 37. 1. The whole of the timber is to be of good quality and properly seasoned, and of the descriptions shown in Table A, as applicable to the several terms of years for which ships may respectively be appointed to remain on the Character A.

* This will entitle the Ship to the distinctive mark ✠

2. In ships claiming to stand twelve or fourteen years from their timber materials, the stem, sternpost, beams, transoms, apron, knightheads, and keelsons, are to be entirely free from sap and from all defects, The rest of the frame to be well squared and free from sap.

SALTING.

3. One year for salting will be added to the term of classification to which a ship may otherwise be entitled, provided that *during her construction* the openings between the timbers of the frame, at the extremities of the vessel, from the deadwood to the height of the air-courses formed midway between the keelson and the hold beam clamps, and also the buttocks, be filled with salt, and the spaces between the upper air-course and the gunwale be filled before the planksheer is fitted; and that, *within six months of the date of launching*, the salting be completed so as to fill the spaces between the transoms and between the timbers of the frame at each end of the vessel for one-fifth her length, from the deadwood to the gunwale, and amidships from the upper part of the bilges to the gunwale, to the entire satisfaction of the Surveyor. For the purpose of retaining the salt between the timbers, stops are to be introduced immediately above all the air-courses and at the upper part of the bilges.

4. The keelson is also to be cased in and salted all fore and aft, excepting in vessels of 200 tons and under, when it will only be required to be cased in and salted for one-fifth of the vessel's length at each end.

5. In the case, however, of vessels entitled in other respects, from their wood materials, to a class not higher than 10 A, where the keelson is composed of *materials named in lines Nos. 1 and 2 of Table A*, it will not be necessary to salt the keelson, except at the ends.

6. The beams on which the weather-deck is to be laid, if salted, are to have a groove gouged on their upper side, except at their extreme ends; the groove to be in width not less than one-fourth the siding of the beam, and one inch in depth, and to be filled with salt as the deck is being laid; but, if not so salted, the beams, *when of wood of the nine years' grade and under*, of all ships to which a year has been or may be granted for "Salting" must, on the occasion of Half-time Survey, be exposed for examination by the removal of deck planking to the extent of one strake all fore and aft at each side of the ship, or to the satisfaction of the Surveyor.* (See Section 34.)

7. The state of the salting throughout such vessels is to be ascertained and reported upon at the Half-time and other Special Surveys, and, if necessary, the salt is to be renewed.

Mem.—The foregoing Rule is not to apply to ships built entirely of Teak.

For application of this Rule in repair of ships under the Second Rule for Restoration, see Sections 57 and 58.†

WORKMANSHIP.

8 The workmanship in vessels is to be well executed, and equally so for all grades.

9. Each set of timbers to be frame-bolted together throughout their entire length; the butts of the timbers to be close, and not to be less than one-third of the entire moulding at that place.

* In cases where the beams have not been salted as above prescribed, the notation † will be added to the record in the Register Book—thus, *Salted.†*

† In cases of ships undergoing large repairs (or in other cases), and where ships have not been salted during construction, provided they are opened out to such an extent that the above requirements can be satisfactorily complied with, special application may be made to the Committee, with a view to having the additional year for salting granted.

10. In *all* ships building for classification, where the heads and heels are not full moulded, the timbers are to be well cross-chocked with a proper butt at each end of the chock, each arm to be not less in length than once and a half the moulding of the timbers they connect; in all cases the chocks are to be of a description of wood equal to the best material required by the Rules for the timbers which they unite, excepting the floor-head chocks, which may be of the materials allowed by the Rules for first futtocks.

11. Where the timbers are scarphed, the scarphs to be of proper length and with a butt at each end, and, in cases where the heads and heels of the timbers which come together are full moulded, a dowel (to be of the diameter from one-fourth to one-third of the moulding of the timber) must be introduced into the ends of such timbers in order to connect them; in the case, however, of vessels of 150 tons and under, provided the heads and heels of the frame timbers be otherwise properly secured to each other, dowels may be dispensed with.

AIR-COURSES.

12. In all ships an air-course must be left all fore and aft, either immediately below or one strake below the clamps of each tier of beams; and, in addition, one or two tiers of air-courses must be left in the hold, between the keelson and hold beam clamp, for one-fifth the entire length of the ship at each end.

POOPS AND FORECASTLES.

Section 38. 1. In the construction of top-gallant forecastles, and poops, the timbers must be of the same materials as are required by Table A for the top-timbers of the frames of ships according to the several terms of years appointed for such ships to remain on the character A, all the said timbers to extend to the planksheer.

2. All the outside planking of top-gallant forecastles, and the sheerstrakes, planksheers, and spirketting of top-gallant forecastles and poops must be of the materials required by Table A for the topsides of the ship; and the shelf and clamps of poops and top-gallant forecastles may be of the same quality as those allowed in Table A for the shelf and clamp of the upper deck.

3. All the beams of top-gallant forecastles, and the mast beams, breast beams and transom beams of poops, to be of the materials required by Table A for the beams of the ship; the remainder of the beams and the waterway of the poops, and the remainder of the planking of poops and top-gallant forecastles may be of cedar, mahogany, Baltic or American red pine, pitch pine, larch, hackmatack, tamarac, or cownie, and rock-elm for such remainder of beams only, and yellow pine or American white spruce in ships below the seven years' grade.

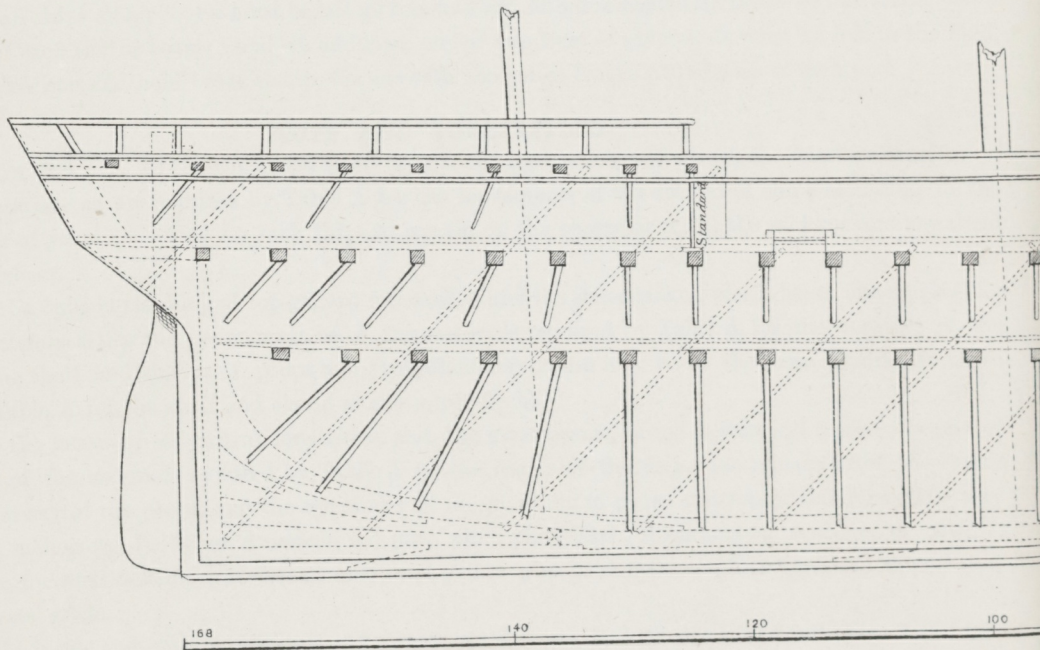
4. In the inside and outside planking, waterways, planksheers, and flat of deck of full poops* and top-gallant forecastles, a reduction of *one-fourth* from the thickness required by the Table B for such planks in the range of the upper deck in ships with two decks, will be allowed; and, in the siding and moulding of the top-timbers and beams of full poops and top-gallant forecastles, a reduction of *one-fifth* will be allowed.

5. The united lengths of poop and forecastle are not to exceed three-fifths of the entire length of the upper deck.

* Parties desirous of making any alteration in the construction of Poops, with a view to diminishing the weight (but preserving the requisite strength), may submit their plans for the Committee's consideration and approval.

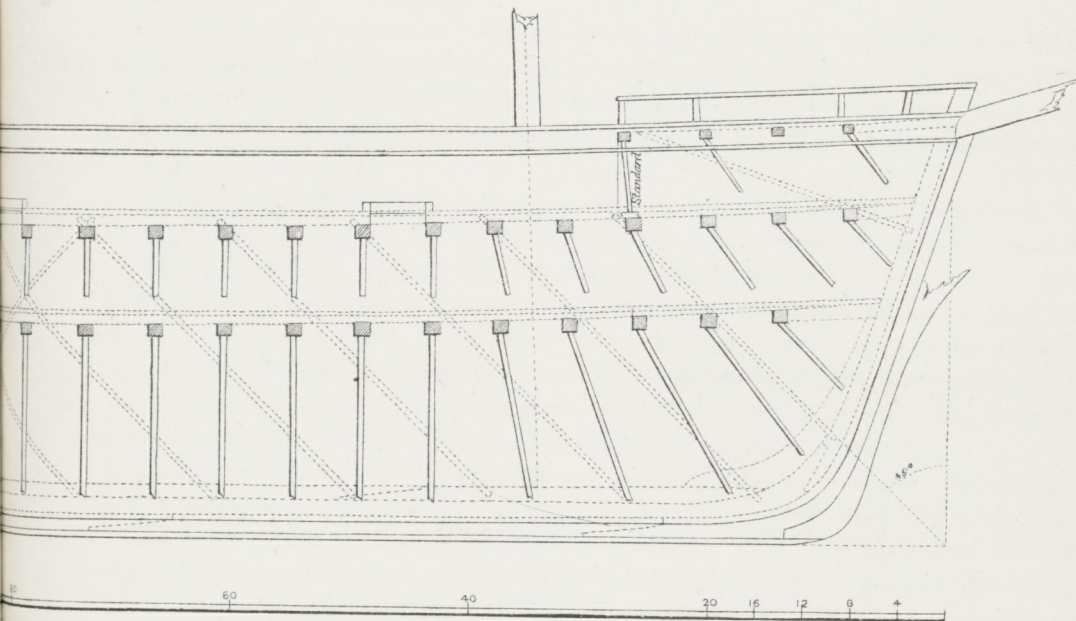
LLOYD'S REGISTER OF BR

*A plan shewing the direction of the Iron
prescribed in the*



AND FOREIGN SHIPPING.

on Frames, and Iron Knees and Riders.
Sections 39 and 62.



RAISED QUARTER-DECKS.

6. The materials required for the construction of raised quarter-decks to be of the same quality as those named in Table A for the main body of the ship.

7. In the inside and outside planking, waterways, planksheers, and flat of deck of raised quarter-decks, a reduction of *one-fifth* from the thickness required by the Table B for such parts in the range of the upper deck in ships with two decks, will be allowed.

SPAR DECKS.

8. In vessels having three decks or tiers of beams, where the space under the upper deck is to be used only for the accommodation of crew and passengers, or to enclose the engine openings of steam vessels, the scantlings are to be regulated as per Section 32.

9. The total depth of hold in spar-decked ships must not exceed thirteen-sixteenths, nor be less than twelve-sixteenths of the ship's extreme breadth.

10. In the construction of spar decks, the timbers must be of the same materials as are required by Table A for the top-timbers of the frames of ships, according to the several terms of years appointed for such ships to remain on the Character A.

11. If *all* the said timbers extend to the planksheer, their siding and moulding may be reduced one-fourth at their heads; but, if only the *alternate* timbers run up to the top height, then a reduction of one-fourth only will be allowed in their moulding at their heads, and in that case there must be a perfect covering board worked all round the ship at the middle deck; and in all cases the middle deck must be a complete deck laid and caulked.

12. All the outside planking, and the sheerstrakes, planksheers, and spirketting must be of the materials required by Table A for the topsides of the ship; and the shelf and clamp may be of the same quality as those allowed in Table A for the shelf and clamp of the middle deck.

13. All the beams before the foremast, and the mast beams, hatch beams, and transom beam, must be of the materials required by Table A for the beams of the ship; and the remainder of the beams and the waterways of spar deck, and the remainder of the planking, may be of red cedar, mahogany, Baltic or American red pine, pitch pine, larch, hackmatack, tamarac, or cowdie; and, in ships below the seven-years' grade, the same may be of yellow pine, American white spruce, or white cedar.

14. In spar decks there may be a diminution of *one-fourth* from the dimensions, fastenings, and bolts prescribed in the tables for the upper deck of ships with two decks (except in the siding of the spar deck beams); but if the outside planking be of either 12 or 14 years' wood, then a reduction of *one-third* may be made in the thickness from that prescribed in Table B for the main sheerstrakes of such vessels.

15. Deckhouses or other erections are allowed on spar decks, but only to the extent of one-tenth of the total superficial area of the spar deck, and are not to exceed seven feet in height. They are not to be placed nearer to either of the ends than one-fifth of the entire length of the vessel.

16. Vessels to which this rule applies, as regards an entire spar deck, will be noted in the Register Book thus—"Spar decked."

THREE-DECKED SHIPS.

17. All dimensions, fastenings, and bolts of the middle deck in vessels having three decks (viz., upper, middle, and lower deck), to be the same as those prescribed in the Tables for the upper deck of ships.

having only two decks ; and a reduction of one-sixth from the dimensions, fastenings, and bolts prescribed in the Tables for the upper deck of vessels having only two (viz., upper and lower deck) will be allowed in the third or upper deck. The middle deck to be a complete deck, laid and caulked.

SCANTLINGS.

Section 39. 1. The Scantlings of the timbers, keelson and keel, thickness of planking, &c., are not to be less than those shown in Table B. (*Vide* Section 32.)

2. The intermediate dimensions for the scantling of timbers between the floor-heads and the gunwale to be regulated in proportion to the distance from the two points.

3. Should the timber and space be increased, the siding of the timbers to be increased in proportion.

4. Whenever ships are built with double floors, thick strakes (*see* Table B) must be worked inside, to extend from the lower part of the short floor-head chocks to the upper part of the long floor-head chocks, and be well bolted through and clenched, with one bolt at the head of each long and short arm of floors, and at the heel of each first and second futtock which comes upon them, from the foremast extending a distance aft equal to three-fifths of the length of the ship ; in such cases, the timber strakes need not be through bolted.

FIR SHIPS OF 600 TONS AND ABOVE, AND ALL VESSELS EXCEEDING FIVE BREADTHS, OR EIGHT AND UNDER NINE DEPTHS IN LENGTH.

5. Ships built in the British North American Colonies, and all ships, the frames of which are composed of Fir, of 600 tons and upwards, and all ships (wherever built) the length of which (measured from the fore part of the stem to the after part of the sternpost on the range of upper deck) shall exceed *five* times their extreme breadth, or *eight* times and under *nine* times their depth, shall have diagonal iron plates closely inserted *outside* the frame.* The said plates to extend from the upper side of upper tier of beams to the lower part of chocks at first futtock heads amidships, and to the same perpendicular height forward and aft, measured from the lower part of the keel.

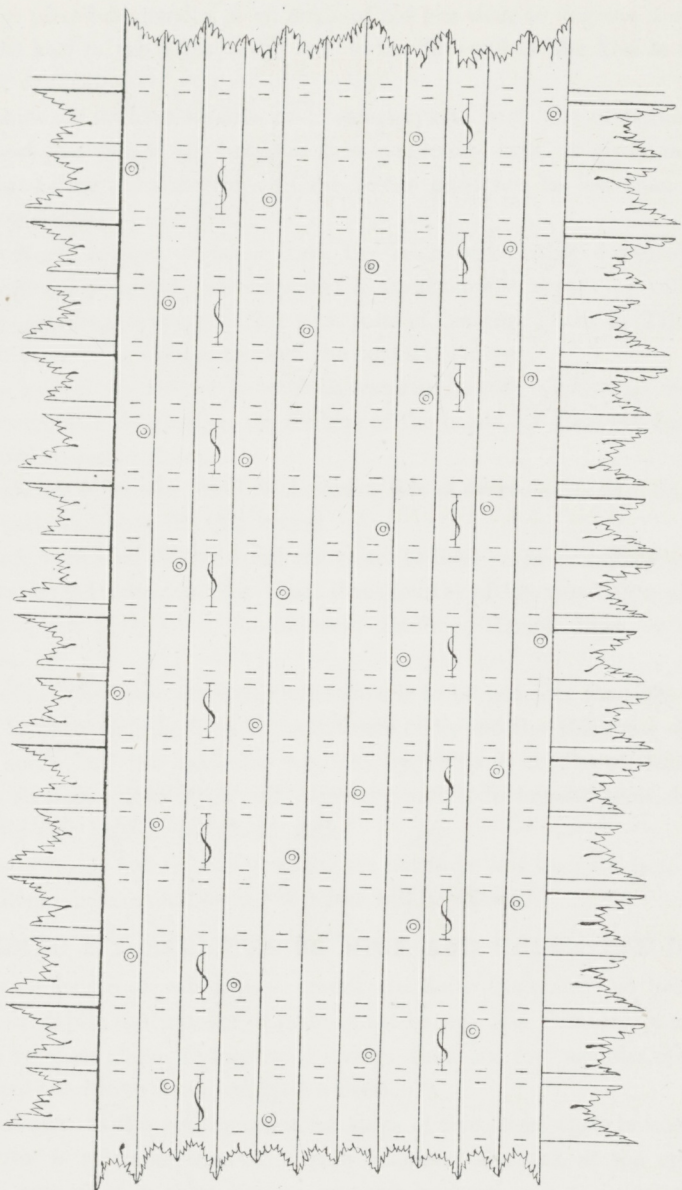
6. When ships are constructed with long and short armed floors, the said plates are to extend to half-way between long floor-heads and first futtock-heads ; the sizes of the plates not to be less than as follows, viz. :—

In ships of 100 tons and under 200 tons			...	.	...	$3\frac{1}{2}$ by $\frac{7}{16}$ in.
"	200	" 400 "	...	...	...	4 " $\frac{1}{2}$ "
"	400	" 700 "	...	...	...	$4\frac{1}{2}$ " $\frac{5}{8}$ "
"	700	" 1,000 "	...	...	...	5 " $\frac{3}{4}$ "
"	1,000	" 1,500 "	...	...	...	$5\frac{1}{2}$ " $\frac{13}{16}$ "
"	1,500	" 2,000 "	...	...	...	6 " $\frac{7}{8}$ "
"	2,000	" and above	...	...	...	$6\frac{1}{2}$ " $\frac{7}{8}$ "

7. The plates to be fastened with bolts, one at each alternate timber, not less in diameter than the sizes given for "through butt bolts" in Table D ; and to be well protected by proper coating, likewise the timbers to be coated in the scores which are to receive the said plates.

* Parties objecting to fit the iron plates on frames as prescribed above, are at liberty to submit, through the resident Surveyor, for the Committee's consideration and approval, such compensation as will, in their opinion, render the introduction of the iron plates unnecessary.

SKETCH SHOWING THE ARRANGEMENT OF THROUGH BOLTS IN THICK STRAKES OVER DOUBLE FLOORS - SECTION 39.



8. The number of plates to be in proportion of not less than one pair to every twelve feet of the ship's entire length taken as above, but not to be more than eight feet asunder measured on a square; the said plates are to be placed diagonally, at an angle of not less than 45 degrees, their lower ends pointing to the after end of the keel in the after body, and to the fore end of the keel in the fore body, four pairs crossing each other amidships.

9. All such ships are to have shelves and waterways to each tier of beams, each equal in contents to the transverse sectional area of the beams at their respective ends, as given in Table C. The breadth or faying surface of shelves and waterways to the beams must not be less than the siding given for the beams of the surface decks.

10. The shelves and waterways are to have the beam ends either dowelled or dovetailed to them, and they are to be properly shifted and scarphed; if fastened with copper or yellow metal, to be bolted through the outside planking at every timber with bolts of the sizes given in Table D. The upper deck binding bolts in all cases to be driven through the outside planking.

11. When the bolts of the hold or lower deck waterway, shelf, spirketting, or clamp, are of *iron*, they may be driven through and clenched on the timbers of the frame, or from the frame and clenched on the waterway, shelf, spirketting, or clamp.

12. A hanging-knee to be also fitted to the lower side of every beam end. In such cases lodging-knees may be dispensed with, except in the mast-rooms.

13. In addition, vessels of 200 tons and above are to have an *inner waterway* fitted on the beams of the upper deck, to extend amidships for about three-fourths of the vessel's length. It may be composed of East India teak, pitch pine, larch, hackmatack, Dantzig, Memel, Riga, or American red pine, for vessels of any class.

14. The breadth of the inner waterway amidships is to be not less than the siding required for the beams, but it may be reduced in breadth at its extreme ends, and the thickness above the beams is to be not less than once and a half the thickness required by Table B for flat of deck. The inner waterway is to be in and out through bolted at alternate timbers; and, if its breadth shall exceed six inches, it is to have two vertical through bolts in each beam end.

15. The shifts of inside and outside planking are not to be less than six feet, unless there be a strake wrought between them, and then a distance of 5 feet will be allowed.

VESSELS EXCEEDING SIX BREADTHS OR NINE AND UNDER TEN DEPTHS IN LENGTH.

16. In vessels the length of which shall exceed *six* times their extreme breadth, or *nine* times and under *ten* times their depth, the number of plates must be not less than one pair to every *ten* feet of the ship's entire length taken as above, but not to be more than six feet asunder measured on a square and to be placed diagonally as before described in this Section.*

17. And in addition to the requirements for ships of five times their breadth in length such ships must be fitted with a rider keelson, or a pair of sister keelsons, at the option of the Owner, the transverse sectional area of such rider keelson or sister keelsons each to be equal to two-thirds of that required in Table B for main keelsons.

* In cases where the length of the ship exceeds ten times the depth, the Builders or Owners are to submit, through the resident Surveyor, for the Committee's approval, their plans for giving the vessel the necessary strength longitudinally.

18. If a rider keelson be adopted, it is to be fastened with a through bolt (of the size required in Table D for keelson bolts), in every frame; or, if the Owner prefers it, every intermediate bolt may be short, passing only through the main and rider keelsons.*

19. If sister keelsons be fitted, they must be fastened with through bolts, in number not less than one in every alternate timber, and of the size required in Table D for "scarphs of keels," &c.

BEAMS.

Section 40. 1. The sizes of the deck and hold beams have been regulated so as to be determined by the length of the beams *amidships*, as shown in Table C. The beams will be required to be of the size of the midship beam, except those at the *after end* of the ship, which may be reduced in proportion to their length.

2. If beams of spruce or yellow pine are used, the siding of such beams shall be one-fourth larger than is prescribed by the above Table, or be increased each way, siding and moulding, equal in area to that amount.

IRON BEAMS.

3. In cases where Iron Beams are fitted in Wood Ships the beams of the upper deck are to be one sixteenth of an inch thicker than is required by the Rules for ships built of Iron, in consequence of the greater space between; and the lower deck or hold beams are to be one-eighth of the depth deeper, and one sixteenth of an inch thicker, than the upper deck beams. The spaces between beams of the several decks not to exceed the spaces at present allowed for wood ships, as per Rule, Section 41. Each tier of beams must have stringer plates riveted on their ends, and tie plates fore and aft, on each side of the hatchways.

4. Parties are to submit, through the resident Surveyor, their plans for attaching Iron beams to the ship's sides, for the Committee's approval.

Section 41. 1. The beams of all decks to be in number and size as hereinafter specified, and to be securely fastened to the sides either with lodging-knees of iron or wood, or with a shelf-piece and waterways, as described in Section 39,† or with a shelf-piece and knees, or with some other security equal thereto.

WATERWAYS AND SHELVES.

2. The depth of waterway required for faying surface against timbers, below the underside of the planksheer, is to be as shown in Table B, to receive in and out bolts at alternate timbers, with alternate through bolts in shelf, and in clamp where there is no shelf.

3. Where shelves and waterways are fitted, each should equal in contents the transverse sectional area of the beams at their respective ends, as given in Table C. The breadth or faying surface of shelves and waterways to the beams must not be less than the siding given for the beams of the several decks.

* In all cases in which a rider keelson is fitted, it must be fastened as prescribed above, irrespective of the relative dimensions of the ship.

† When the shelves and waterways are fitted and bolted as described in Section 39, having also a hanging-knee to the lower side of every beam end, then lodging-knees may be dispensed with, except in the mast-rooms. In ships of 500 tons and under, where lodging-knees properly bolted are applied, the ordinary plank-clamps may be used, but the bolting of them at alternate timbers, as per Table B, cannot be dispensed with.

4. A hanging-knee to be also fitted to the lower side of every beam end. In such cases lodging-knees may be dispensed with, except in the mast-rooms.

5. The shelves and waterways are to have the beam ends either dowelled or dovetailed to them, and they are to be properly shifted and scarphed; if fastened with copper or yellow metal, to be bolted through the outside planking at every timber with bolts of the sizes given in Table D. The upper deck binding bolts in all cases to be driven through the outside planking.

6. When the bolts of the hold or lower deck waterway, shelf, spirketting, or clamp, are of *iron*, they may be driven through and clenched on the timbers of the frame, or from the frame and clenched on the waterway, shelf, spirketting, or clamp.

7. All vessels of 200 tons and above to have an inner waterway, as stated in Section 39.

8. All ships of 150 tons and above to have vertical knees to the DECK beams; and those of 200 tons and above to have vertical knees to the HOLD beams, in number as shown in Table E.

DEPTH OF HOLD FOR SPACING OF BEAMS.

9. In vessels of 13 feet and under 15 feet depth of hold, the spacing of the hold beams not to exceed 8 feet apart, and the deck beams 4 feet. Vessels of 15 feet and under 18 feet hold, the spacing not to exceed 8 feet and 4 feet apart alternately, or in that proportion; the deck beams to be placed one over every hold beam, and one in all double spaces. In vessels of 18 feet hold and above, the spacing of the beams not to exceed 4 feet 6 inches; the deck beams to be one over every hold beam.

10. The depth in all such cases to be determined by taking the measure from the top of the limber-strake (the thickness of which, for measurement, is to be taken as prescribed in Table B) to the top of the upper deck beams.

11. Ships having a depth of hold, measured from the limber-strake to the under side of the lower deck beam, above 13 feet but not exceeding 15 feet, must be secured with iron riders of the sizes, and be fastened, as shown in Table F, and in number not less than one on every fourth floor, on each side, from fore side of foremast to aft side of mizen-mast, to extend from the lower deck beams downwards so as to receive not less than two bolts in a substantial part of the floors; or by orlop beams, sufficient in number and properly secured.

12. All ships having two decks (*viz.* upper and lower deck), and exceeding 24 feet in depth from the top of the limber-strake to the top of the upper deck beams, or having three decks (*viz.* upper, middle and lower deck), and exceeding 24 feet in depth from the under side of the MIDDLE DECK, to have orloe beams, the number to be in no case less than one-half the number of lower deck beams in the space between the foremast and the mizen-mast, except in the case of flush deck ships, when a depth of 25 feet will be allowed, provided in either case the lower hold does not exceed 15 feet, measured as above from the limber-strakes to the under side of the lower deck beam. Should a house be constructed on such flush deck ship for lodging crew or for store-room, the same not to extend within 10 feet of the sternpost.

13. The application of this Rule to British North American built ships, and Fir Ships, will not exempt them from the full operation of the Rule, Section 62.

14. Every ship exceeding 150 tons to have at least one crutch for the security of the heels of the

after timber of the frame; one pair of pointers in addition to a knee at each end of the wing transom to connect the stern frame with the after-body of the ship; and a transom over the heels of the stern timbers properly kneed.

15. The heels of the cant timbers forward and aft to be stepped into the deadwood and bolted through.

16. All hatchways and mast holes to be properly framed to receive half beams where necessary, and to have mast partners to each tier of beams, except the orlop beams. The mast holes, skylights, and companions to be properly secured to the satisfaction of the Surveyors.

FRAME.

Section 42. 1. All timbers of the frame, including those of the poop and forecastle, to extend to the extreme height.

2. The shifts of timber in vessels of 200 tons and upwards to be not less than one-seventh of their main breadth; and, in ships under 200 tons, to be not less than one-sixth of their main breadth.

PLANKING.

Section 43. 1. The outside planking to be of good quality, of the description prescribed in Table A, to be clear of sap and free from all defects.

2. The inside planking to be of the description shown in Table A, and free from all foxy or druxy defects, and decayed knots. With regard to the ceiling plank, and the efficiency of its fastening, it will be required that the planking shall be properly shifted and fastened so that there shall be at least either treenails or through bolts, or short bolts, in each plank of the ceiling *in every timber*.

Section 44. 1. No butts to be nearer than 5 feet to each other (*see* Section 39, for vessels exceeding five breadths or eight and under nine depths in length), unless there be a strake wrought between them, and then a distance of 4 feet will be allowed; and no butts to be on the same timber, unless there be three strakes between, as more particularly shown in the diagram annexed (*see Plate*), but vessels under 200 tons will be exempted from the full operation of this rule; and in ships of larger tonnage a literal compliance with it will be dispensed with in cases wherein it may be satisfactorily proved that the departure from the rule is only partial, being confined to the ends of the ship, or the planking of the topside, and does not injuriously affect the ship's general strength; but such relaxation will not be sanctioned unless an accurate description of the shifting of the plank be transmitted by the Surveyors, to enable the Committee to form a proper judgment on the case.

2. The thickness of the plank, according to the tonnage of the ship, is not in any instance to be less than is prescribed in Table B.

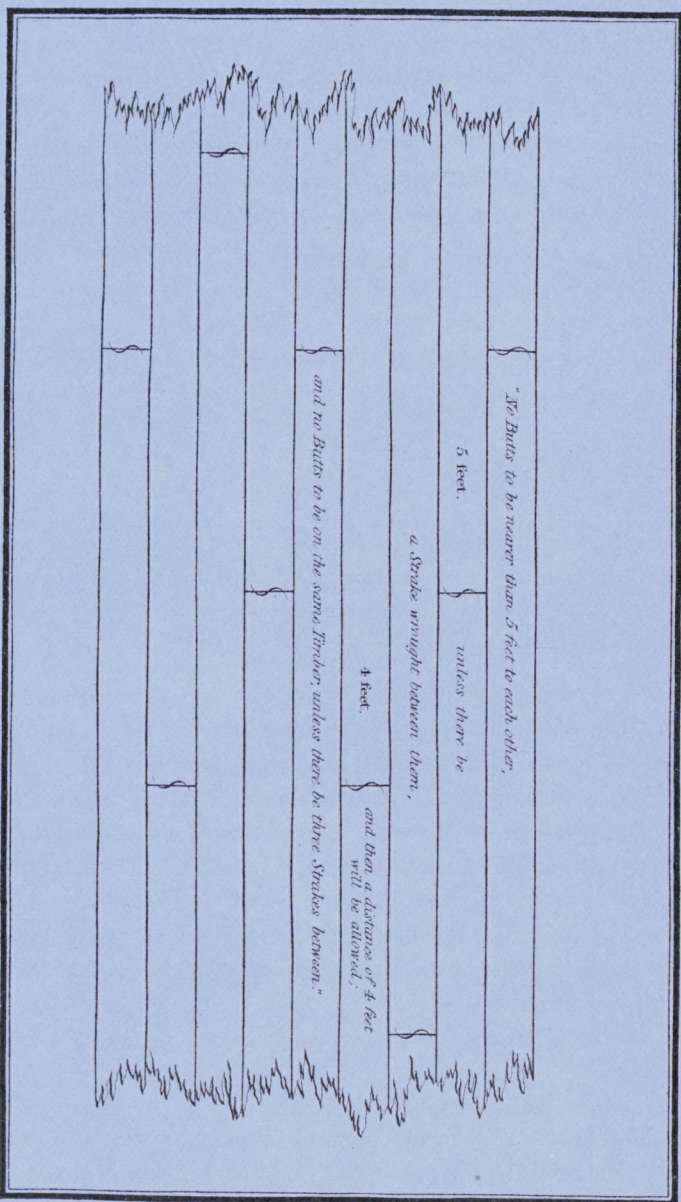
BREADTH OF WALES.

Section 45. 1. The breadth of the wales in every case is to be regulated as under, viz. :—

2. When the extreme length of the ship, measured from the fore part of the stem to the after part of the sternpost on the range of upper deck, is six times her depth of hold (or less), the wales are to be in breadth 3in. to every foot of the depth of hold.

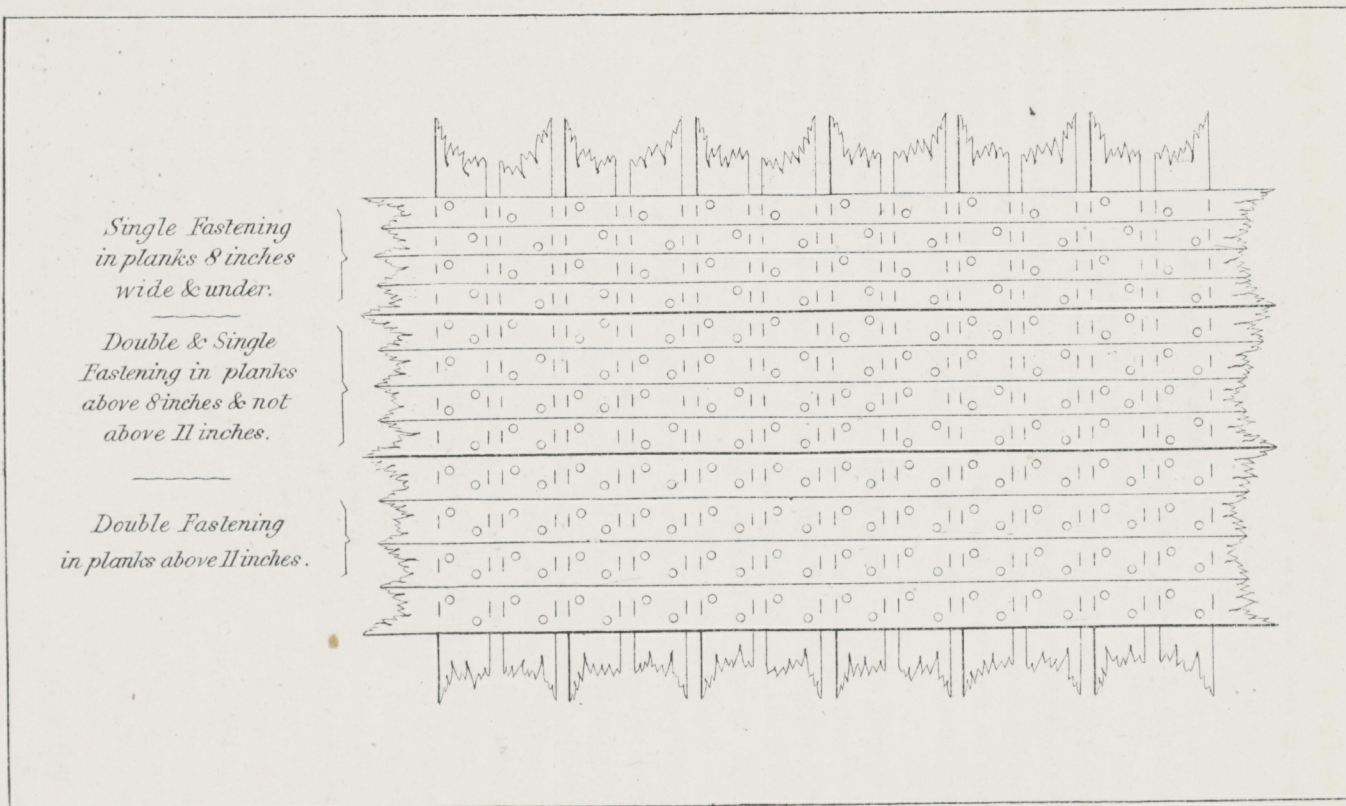
3. When the extreme length of the ship is eight times her depth of hold, the wales are to be in breadth 3½in. to every foot of the depth of hold.

SKETCH DESCRIPTIVE OF THE REQUIRED SPLITTING OF PLANK.—Section 44. (See also Section 39.)



The Sketch shows the principle on which the Butts should be arranged, so as to avoid Stepping, which is deemed bad Workmanship.

SKETCH SHOWING THE PROPER ARRANGEMENT OF TREENAILS OR BOLTS _SECTION 46.



4. When the extreme length of the ship is ten times her depth of hold (or more), the wales are to be in breadth 4 in. to every foot of the depth of hold.

5. And other intermediate dimensions in these proportions.

BILGE PLANKS.

6. The breadth of the bilge planks to be two-thirds that of the wales.

FASTENINGS.

Section 46. 1. Treenails to be of good quality, and of a description equal to the best material through which they pass.* If, however, in ships built in the British North American Colonies, or of Fir, treenails be used of materials not inferior to those comprised in line No. 2 in Table A, including Locust and all Australian and tropical hard woods of durable quality, and Beech in the bottom not higher than floor-heads, a notation of "*Hard Wood Treenails*" will be inserted against the ship's name in the Register Book.

2. The treenails are to be straight and circular, being either engine-turned, compressed, or planed, not grained or knotty, and must be free from sap and tightly driven, and in all cases the treenails are to be efficiently caulked or wedged outside. In all cases in which planks above eleven inches in width shall be used, they must be double fastened; and those above eight inches in width must be treenailed double and single, except bolts intervene; and, if less than that width, then to be treenailed single.

3. Not less than two-thirds of the treenails are to be driven through the inside planking, clamps, &c.

4. Every butt in each outside plank to be fastened with *two* bolts, one of which may be in the adjoining timber, and one to be through and clenched.†

5. The bilges to be secured with bolts so placed that from the foremast, extending a distance aft equal to three-fifths of the length of the keel, there shall, in ships under 300 tons, be at least one bolt through and clenched in each first futtock; and that in ships of 300 tons and upwards there shall be at least two bolts through and clenched for each set of timbers in one or other of the thick bilge strakes; or the bilge planks may be secured as defined in *Paragraph 1* for EXTRA PERIOD ALLOWED FOR METAL FASTENINGS.

6. All the bolts of the knees, breast-hooks, crutches, riders, transoms, pointers, and keelsons, shelf-pieces, waterways, heels of timbers against fore and after deadwood, and of all other material fastenings, are to be driven through and clenched on rings of the same metal as the bolts. In vessels of 150 tons and under, where the keel is of American Rock Elm, or material of equally hard texture, and where the middle line bolts are of iron, they may be allowed to be driven one and one-half inch short of the underside of the keel, with a wood plug tightly driven against their ends.

7. In knees or knee riders vertically or diagonally fitted, the throat bolts in the side arms are to be placed as near as possible to (but not in) the angle of their throats, and the next bolt should not be at a greater distance than ten inches from the throat bolt, where practicable; also in the bolting of lodging or horizontal knees the same arrangement should be maintained, where the spacing of the timbers will admit of it. "*Jumped knees*" will not be allowed.

* Parties desiring a modification of this requirement must make special application to the Committee in each case.

† Where thick garboard strakes are used, they must be bolted horizontally through the keel and each other.

8. The up and down bolts in the knees to beams are not required to be through the deck, but whether clenched upon the beams, or upon the deck, they must be clenched on rings of the same metal as the bolts.

9. The two bolts, the nearest to the crowns of the pintles and braces of the rudder, are also to be through and clenched, those through the braces to be in the main piece of sternpost.

10. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber *in each strake*.*

11. When the heels of the first futtocks meet at the middle line on the keel under the keelson (either with full moulding or with *butted* chocks) the through bolting of the limber strakes may be dispensed with.

12. When the lower deck or hold beam waterways, shelves, spirkettings, clamps and wood lodging knees, the bilge planks, limber strakes, and wood hooks, crutches and pointers, are fastened with iron, the bolts may be either driven through and clenched on the timbers of the frame, or from the timbers of the frame and clenched inside (if iron lodging knees are fitted and fastened with iron, the bolts must be driven from the inside), provided that the in and out bolts of the hanging-knees to the hold or lower deck beams, and those of the knee riders, iron hooks, crutches, or pointers, where such are fitted, are of copper or yellow metal driven through and clenched on the outside plank; and also one bolt in each butt of the bottom planking from the keel to one-fifth the depth of hold below the upper side of the upper deck, and parallel thereto forward and aft, be driven through and clenched on the ceiling, to be of copper or yellow metal, and, in addition, all the short bolts within the same range to be of copper or yellow metal.

EXTRA PERIOD ALLOWED FOR METAL FASTENINGS.

13. *Paragraph 1.*—An additional year will be allowed to Ships of the A character, either on original Classification or on Restoration under the Second Rule, if fastened externally with treenails, and with copper or yellow metal bolts, to the exclusion of iron, in the outside planking, keel, keelson, deadwood, stem and sternpost, also in the hanging knees and riders, hooks and crutches (the bolts of which must pass through the outside planking), from the lower part of the keel up to the height of one-fifth the midship depth of hold, set down below the upper side of the upper deck at the side, and parallel thereto forward and aft; above which all external bolt fastenings, and the fastenings of the deck, may be of iron, if properly galvanized. The bolts in the heels of timbers abutting against the deadwood, forward and aft, must be of copper or yellow metal driven through and clenched on rings of the same metal; but the limber, bilge, *lower deck or hold beam*, shelf or clamp, and lodging-knee bolts, may be of plain iron, driven through, and clenched on the timbers of the frame, or from the timbers of the frame, and clenched inside. The whole of the remaining fastenings inside may be of plain iron. If iron lodging knees are fitted, their fastenings must be driven from the inside. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber in each strake.

14. In all cases through bolts must be clenched on rings of the same metal.

15. Vessels thus fastened will have the notation of cf. (copper fastened) recorded in the Register Book.

* Watercourses are to be properly formed at underside of all floors and futtocks at the limbers on each side of middle line so as to allow water to reach the pumps freely.

16. *Paragraph 2.*—Two additional years will be allowed to ships of the A Character, either on original Classification or on Restoration under the Second Rule, if fastened externally with treenails, and with copper or yellow metal bolts or dumps, to the exclusion of iron, from the lower part of keel to the waterway inclusive, and the whole of the inside bolt fastenings, including fastenings of deck, frame bolts, and bolts in iron straps on timbers, and also the chain and preventer bolts, be of properly galvanized iron; but the bolts in heels of timbers abutting against deadwood, forward and aft, must be of copper or yellow metal driven through and clenched on rings of the same metal. The limber, bilge, *lower deck or hold beam*, shelf or clamp, and lodging-knee bolts, may be of properly galvanized iron if driven through and clenched on the timbers of the frame, or from the timbers of the frame and clenched inside. If iron lodging-knees are fitted, their fastenings must be driven from the inside, but the whole of the bolts in the hanging-knees, riders, hooks and crutches, must pass through the outside planking and be of copper or yellow metal. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber in each strake.

17. Vessels thus fastened will have the notation of CF. (Copper Fastened) recorded in the Register Book.

18. *Paragraph 3.*—Three additional years will be added on original Classification if, in lieu of treenails above the floor-heads, the whole of the planking is fastened with bolts of copper or yellow metal to the waterway inclusive, and the whole of the inside bolt fastenings, including fastenings of deck, frame bolts, and bolts in iron straps on timbers, and also the chain and preventer bolts, be of properly galvanized iron; but the bolts in heels of timbers abutting against deadwood, forward and aft, must be of copper or yellow metal *driven through and clenched on rings of the same metal*. The whole of the bolts in the hanging and lodging-knees, riders, hooks and crutches, must be through and clenched on the outside planking. In such cases of substitution the bolts must be in number the same as is already prescribed above for treenails; the proportion of through bolts must be at least two-thirds, and all the through bolts must be of malleable metal, and clenched on rings of the same metal inside.

19. The sizes of the copper or mixed metal bolts must be as under, viz. :—

In ships of 150 tons and under 200 tons	$\frac{5}{8}$ in.	} Smaller sizes must not be used.
200 ditto 350 "	...	...	...	$\frac{3}{4}$ in.
350 ditto 500 "	...	...	...	$1\frac{1}{8}$ in.
500 ditto 700 "	...	...	...	$\frac{3}{4}$ in.
700 ditto 900 "	...	...	...	$1\frac{1}{8}$ in.
900 and above	...	...	...	1 in.

and the lengths of the short bolts not less than as follows, viz. :—

When used in plank of $2\frac{1}{2}$ inches, to be 7 inches long

3 "	8 "
4 "	10 "
5 "	12 "

and so on in proportion for plank of other thicknesses. The sizes of the bolts required in the several parts must not be less than is shown in Table D.

20. Vessels thus fastened will have the notation of C.B. (Copper Bolts instead of Treenails) recorded in the Register Book.

21. In British North American or Colonial built ships, and all ships wherever built, the frames of which are composed of Fir, in order to entitle them to the additional term proposed by these sections, Nos. 1, 2, and 3, the rule with reference to "Salting" (Section 37) must in all cases have been complied with originally, or during repair under the Second Rule for Restoration.

Section 47. In every case where the butt bolts are not through and clenched, One Year will be deducted from the period which would otherwise be assigned in the classification of the vessel.

SHIPS BUILT UNDER A ROOF.

Section 48. Ships built under a substantial and efficient roof, kept in good repair, which shall project at each end beyond the length, and on each side beyond the breadth, a quantity equal to half the breadth of the vessel, shall have One Year added to the period prescribed, provided they shall have been surveyed whilst building, and shall have occupied a period of not less than twelve months in their construction, and in which no plank, except as follows, shall have been worked until the expiration of at least three months after the frame was completed, viz. :—not more than three strakes of bilge planks, and two strakes of outside plank in the way of each tier of beams, also the clamps inside, so that the beams may be put in their places.*

Section 49. The scantlings and dimensions for all sized vessels to be proportionately regulated, agreeably to Table B.

SHIPS CLASSED 11 A.

Section 50. Ships surveyed while building, in which *all the materials required for a Twelve Years' Ship shall have been used*, and most of the other requisites for that grade fulfilled, but which, from partial deficiencies, may not appear to be in all respects entitled to the full period, although superior to the description of a Ten Years' Ship, may be marked in the book thus, 11 A; thereby denoting that they are to remain on that grade *Eleven Years*, provided they be kept in a state of efficient repair.

SHIPS CLASSED 10 A.

Section 51. Ships surveyed while building, in which every *alternate* set of timbers are framed together throughout their entire lengths, and the scantling and shifts of the timbers, the thickness and shifts of the planks, and size of fastenings may be the same as are required by the Rules, and the description of materials prescribed in Table A shall also have been used, but in which the frame is not so well squared as is required for Twelve Years' ships, but which shall be *in other respects* equal thereto, shall be marked 10 A; thereby denoting that they are to remain on that grade for *Ten Years*, provided they be kept in a state of efficient repair.

Section 52. 1. In all other cases, ships surveyed while building, and constructed of the materials of good quality, hereinafter shown in Table A, will be allowed the several terms of years respectively appointed, provided they be kept in a state of efficient repair.

* In ships not exceeding 400 tons, a relaxation of the period herein required may be allowed (but not exceeding four months) provided application be made to the Committee, who will appoint a Special Survey, and who will require a report of the date when the timber was felled, its condition after being sided and moulded and stacked for seasoning, and also when in frame.

SHIPS NOT BUILT UNDER SURVEY.

2. All ships, not built under Survey, whether in the United Kingdom or abroad, for which a character may be claimed, must be placed in dry dock or laid on blocks in order that their bottoms may be seen and properly examined. They will also be required to have their timbers completely exposed for examination, by a plank or listing, as the Surveyor (who must be an exclusive officer of the Society) may direct, being taken out, either inside or outside, all fore and aft, on both sides, equal to one entire strake, at the first futtock-heads, and another between decks. A few treenails must likewise be driven out, so that the Surveyors, from actual inspection, may be satisfied whether or not they are of the quality and make prescribed by the Rules; and the same, being thus ascertained, shall be reported to the Committee, and a character assigned. (*See also* Section 20.)

3. If the ship be 400 tons and upwards, the Survey must be made by two Surveyors, and their report signed accordingly.

Section 53. 1. Ships built in the United Kingdom—or in Quebec; or St. John, New Brunswick, or Miramichi, and Northern Ports of New Brunswick, or in Prince Edward Island or built in Nova Scotia after 1864—and *not surveyed while building* by the Surveyors to this Society, and all ships, the Owners or Builders of which may have refused or declined to permit them to be surveyed at the several periods prescribed by the Rules, will have One Year deducted from the period which would otherwise have been assigned, in consequence of their not having been submitted to Survey during their construction.

2. In no case, however, will a higher grade than 10 A be assigned *for wood materials* to ships built in the United Kingdom which shall not have been surveyed while building.

CONTINUATION OF SHIPS CLASSED A.

Section 54. 1. If on the termination of the period of original designation, or if, at any subsequent period not exceeding two thirds of the number of years assigned originally, or on Restoration (provided the last paragraph, Section 56, and 2nd and 3rd paragraphs, Section 57, be complied with), the Owner should wish to have his ship remain, or be replaced on the letter A, he is to send a written notice thereof to the Secretary, and the Committee shall then direct a Special Survey, as follows, to be held by not less than two competent persons to be appointed by the Committee, one of them to be a Surveyor, the exclusive officer of the Society.

2. The period assigned for Continuation will commence from the time of the expiration of the term assigned originally or which might have been assigned on the letter A, without regard to the date when the Survey for this purpose may subsequently have been held. This period may be either one-third or two-thirds the number of years assigned originally, or on Restoration, if the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with, dependent on which of the following Surveys, designated Survey No. 1, and Survey No. 2, be complied with. (*See also* Section 52.)

3. Ships so Continued shall be distinguished in the Register Book by the number of years for which the character is extended being inserted separately under the number assigned on the original character, thereby denoting that the ship has been found on survey in such good and efficient order as to entitle her to be continued for the specified number of years.

4. But if during the last year of the period assigned originally, or on Restoration (when the Restoration is of such a character as to allow of Continuation—see last paragraph of Section 56 and 2nd and 3rd paragraphs of Section 57), the owner of the ship shall, in consequence of her being about to proceed on a distant foreign voyage, apply to have her specially surveyed for Continuation on the letter A, a Special Survey shall be held conformably with this Section.

5. Where such Continuation is assigned, the Half-time Survey as prescribed in Section 34 is to be held, and the vessel to be subject to an annual survey.

6. In cases of the repair of Ships for Continuation of the A Character, materials of a lower grade than those used in the original construction of the ship will be permitted to be used, but they will be noted in the Register Book. Should the materials thus used be not removed on Restoration, the term of Restoration will be reduced, the reduction being regulated by the Mixed Material Rule, Section 34.

7. If, at the termination of the period of Continuation assigned on the original class under Survey No. 2, the owner desires a *further* Continuation of the A Character, the vessel must be submitted to a Special Survey, designated Survey No. 3, when, if found or placed in good and efficient condition, she may be further Continued for a period of one-third the number of years assigned originally; such further Continuation to date from the expiration of the previous Continuation; and if at the end of the term thus assigned the requirements of the Half-time Survey, Section 34, be complied with, and the vessel be favourably reported upon by the Surveyors, she will be allowed to lapse to the character of A in Red (subject to annual Survey) until the expiration of a period of two-thirds the number of years originally assigned, dating from the completion of the Special Survey No. 3.

SURVEY NO. 1.

8. The ship must be either placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

9. To be scraped or dubbed bright, from the light water-mark upwards, including the planksheers and waterways, so as to expose the surface of the plank to view.*

10. The hold to be cleared, and proper stages to be made both inside and outside.

11. All air-courses and the limbers to be cleared.

12. The condition of the timbers of the frame to be further ascertained, by a *new* listing not less than four inches wide being *cut* out of the ceiling at each end of the hold, on each side, between the keelson and air-course under hold beam clamp, for one-fifth the entire length of the ship.

13. One treenail to be driven out from every alternate frame or fourth timber, between the upper

* If the ship has been sheathed with wood over felt, within a period of five years, and the plank from the light water-mark upwards shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained, and favourably reported upon by the Surveyors, the stripping from the light water-mark upwards may, on application to the Committee, be dispensed with, providing that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listings of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed, shall prove to be in good condition; but, whenever the sheathing is removed, the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

If the ship has been sheathed with metal within a period of two years, and it shall appear to the Surveyors that stripping from the light water-mark upwards may be dispensed with, the case will receive due consideration on application to the Committee.

edge of the wales and planksheers, and one from every alternate frame or fourth timber, between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

14. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

15. If the fastenings in the range of the lower deck be of iron not through the outside planking, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through bolted in these parts, as the Surveyors may direct.

16. All treenails, bolts, and listings, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

17. Where the middle line bolts are of iron, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel, in each alternate frame, also through the stem, apron, sternpost, and deadwood.

18. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

19. The condition of the oakum and caulking to be ascertained.

20. In the case of vessels allowed an additional year in classing for Salting, under Section 37, the state of the salting throughout such vessels is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

21. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

22. The cables, masts, spars, and general equipment to be attended to, as prescribed in Sections 72 to 76.

23. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, whether of iron or copper, and the outside planks, through which they pass, the planksheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, inner-post, and transoms; the floors, keelsons, and keel; the rudder and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

24. The ship to be efficiently repaired with suitable materials.

25. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and efficient state, the Committee shall continue such ship on the letter A, for such further period as they may think fit, not exceeding, however, one-third of the number of years which had been assigned originally, or on Restoration. No Ship, however, can have a continuation of the A Character after Restoration unless the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with.

26. Ships classed A for a less period than six years, will be allowed a Continuation of two years, provided that in addition to the above requirements the Owner shall have removed a plank in each buttock.

27. Ships built in the British North American Colonies will have to comply with the Rules, Section 63.

28. If, however, at the time of the above Survey, or at any time during the term of Continuation, the ship be *diagonally* doubled according to Section 68; then in the case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding 5 and under 12 years' grade will be allowed 3 years additional, and those built of 12 years' materials and upwards, 4 years additional; provided a strake all fore and aft at the upper edge of the doubling, or the planksheer be removed.

SURVEY NO. 2.

29. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

30. All sheathing (wood or metal) to be entirely stripped off the bottom, and elsewhere.*

31. All the outside planking from the light water-mark upwards, including the planksheers and waterways, to be scraped or dubbed bright.

32. The hold to be cleared, and proper stages made both inside and outside.

33. All air-courses and the limbers to be cleared.

34. The condition of the timbers of the frame to be further ascertained by the removal of all the treenails in *one* strake in the topsides fore and aft on each side, and by the removal of *two* planks on each side above the wales (except in vessels of 200 tons or under, when the removal of *one* plank on each side will be deemed sufficient).

35. In addition, a plank to be removed in each bow and each buttock.

36. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

37. If the *whole* of the treenails from the light water-mark upwards have to be renewed, the removal of a plank in each bow and buttock will be sufficient, provided the timbers in the treenail hole be examined, and found in good condition.

38. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

* If the ship has been sheathed with wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with, provided that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed, shall prove to be in good condition; but, whenever it is removed, the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

39. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

40. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, sternpost, and deadwood.

41. Plank, or *new* listing of ceiling of sufficient breadth (not less than 4 inches wide), at the discretion of the Surveyors, to be cut out of the ceiling in the range of the floor-heads, or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, at each end of the hold on each side for one-fifth the entire length of the ship, and for the remaining three-fifths of the ship's length, the state of the timbers to be ascertained by driving out a treenail from every fourth timber in one or other of the strakes of bilge planking. If the Shipowner should prefer it, planking may be removed *outside* at each end of the ship in the range of the floor-heads.

42. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the waterways on each side to be taken up except where it is covered by a poop or a forecastle; and where this exception arises the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding, and be found good.

43. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

44. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

45. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

46. The condition of the oakum and caulking to be ascertained.

47. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

48. The anchors, cables, masts, spars, and general equipment, to be attended to as prescribed in Sections 72 to 76.

49. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, whether of iron or copper, and the outside planks through which they pass; the planksheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, inner-post, and transoms; the floors and keelson; the keel, rudder, and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

50. The ship to be efficiently repaired with suitable materials.

51. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs

she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and thoroughly efficient state, the Committee shall Continue such ship on the letter A for such further period as they may think fit, not exceeding, however, *two-thirds* of the number of years which had been assigned originally or on Restoration. No ship, however, can have a Continuation of the A Character *after Restoration*, unless the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with.

52. If, however, at the time of the above Survey, or at any time during the term of Continuation, the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years' additional on account of such diagonal doubling; those built of materials exceeding the 5 and under 12 years grade will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional.

53. If such extended term be given for the doubling, the materials used in the repairs must be equal in grade to those required in the original construction of the ship, or she will be liable to a reduced class regulated by the Mixed Material Rule, Section 34.

SURVEY NO. 3.

FURTHER CONTINUATION OF SHIPS CLASSED A.

54. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

55. All sheathing (wood or metal) to be entirely stripped off the bottom and elsewhere.*

56. All the outside planking, from the light water-mark upwards, including the planksheers and waterways, to be scraped or dubbed bright.

57. The hold to be cleared, and proper stages made both inside and outside.

58. All air-courses and the limbers to be cleared.

59. The condition of the timbers of the frame to be further ascertained by the removal of planking equal to one strake fore and aft on each side above the wales; and a short plank in each buttock. In addition, a strake of planking to be removed, or a new listing of sufficient breadth not less than four inches, all fore and aft on each side in the ceiling above the floor heads; or, if the Shipowner should prefer it, a strake of planking may be removed outside at the same height.

60. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails and the timbers and planking in the treenail holes.

61. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier

* If the ship has been sheathed in wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with; provided that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings and caulking so exposed shall prove to be in good condition; but, whenever it is removed, the outside planking is to be scraped and dubbed bright, and examined as prescribed by the above Rule.

of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

62. If the fastenings in the range of the lower deck be of iron, *not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.

63. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, sternpost, and deadwood.

64. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the water ways on each side to be taken out, except where it is covered by a poop or a forecastle; and, where this exception arises, the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding, and be found good.

65. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

66. All yellow metal bolts to be tested when practicable, to ascertain if any are broken.

67. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

68. The condition of the oakum and caulking to be ascertained.

69. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

70. The anchors, cables, masts, spars, and general equipment, to be attended to as prescribed in Sections 72 to 76.

71. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, whether of iron or copper, and the outside planks through which they pass, the planksheers, waterways and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, inner-post, and transoms, the floors and keelson, the keel, rudder, and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

72. The ship to be efficiently repaired with suitable materials.

73. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and thoroughly efficient state, the Committee shall continue such ship on the letter A for such further period as she may be eligible, not exceeding, however, *one-third* of the number of years which had been assigned originally, such further Continuation to date from the expiration of the term of Continuation assigned under the Second Survey.

74. If, however, at the time of the above Survey, or at any time during the term of Continuation,

the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under 12 years' grade will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional.

75. If such extended term be given for the doubling, the materials used in the repairs must be equal in grade to those required in the original construction of the ship, or she will be liable to a reduced class regulated by the Mixed Material Rule, Section 34.

RESTORATION OF SHIPS TO THE CHARACTER A.

Section 55. 1. If at *any age* of a vessel the Owner be desirous to have his ship Restored to the A character, such Restoration will be granted for a period not exceeding *one-half* of the term originally assigned, the same to be calculated from the date of such repairs; provided that a Special Survey as hereafter described be held by two Surveyors, one of them to be an exclusive Officer of the Society, and that all repairs found necessary be completed to their satisfaction.

2. If, at the expiration of such Restoration, the Owner be desirous to have his ship again Restored, she must be subjected to the requirements of the second Rule for Restoration.

REQUISITES FOR RESTORATION.—FIRST RULE.*

Section 56. 1. The ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

2. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

3. All the outside planking from the light water-mark upwards, including the waterways, poop and forecastle, planksheers, the stem, knight-heads and hawse-timbers, and the sternpost and rudder, where exposed; also the shelves, clamps, hold-beams, waterways, all inside planking, and the keelson to be scraped or dubbed bright.

4. The hold to be cleared, and proper stages made both inside and outside.

5. All air-courses and the limbers to be cleared. The condition of the timbers of the frame to be further ascertained by the removal of one strake of topside planking all fore and aft on each side.

6. In addition, a plank to be removed in each bow and each buttock.

7. In all cases the outside planks through which the chain and preventer bolts pass must be removed.

8. In flush-deck ships all the planksheer and spirketting to be removed, but in ships having a poop or top-gallant forecastle it will only be necessary to remove the planksheer and spirketting between these, and the mouldings in continuation of the planksheer forward and aft, or a portion of topside planking extending from the fore part of the poop aft, and from the after part of the top-gallant forecastle forward.

9. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the planksheer, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, also one to be driven out from every fourth timber for half the vessel's length amidships on each side at the bilge, and at such other parts of the vessel as the

* In the case of the Restoration of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

Surveyors may direct, in order that the state of the treenails, and the timbers and planking in the treenail holes, may be ascertained.

10. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

11. If the fastenings in the range of the lower deck be of *iron not through the outside planking*, one plank on each side is to be removed, so that the condition of these fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

12. *Where the middle-line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel, in each alternate frame also through the stem, apron, sternpost, and deadwood.

13. A strake of ceiling to be removed all fore and aft, in the range of the first futtock-heads, or at such height forward and aft as may, in the judgment of the Surveyors, best expose the timbers of the frame and chocks to view.

14. One plank of ceiling on each side at the floor-heads to be removed.

15. In order to ascertain the condition of the deck beam ends, a strake of deck next the main or inner waterway to be removed from each tier of beams, excepting that, in ships having a poop or a top-gallant forecastle, the upper deck need not be removed abaft the first beam within the poop, or before the first beam within the forecastle; provided the remainder of the upper deck beams under the poop and forecastle be tested by boring and sounding, and be found good.

16. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

17. All yellow metal bolts to be tested, where practicable, to ascertain if any are broken.

18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

19. The condition of the oakum and caulking to be ascertained.

20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.

22. When in the state above described, the ship is to be submitted to a special survey and examination, at which the attention of the Surveyors is to be particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the waterways and beams so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost and transoms; the floors, keelson, and keel; the rudder and all its parts and hangings; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

23. If, after the above examination, the Owner should consent to take out all planks timbers, beams, knees, waterways, fastenings, and other parts that may be found defective, or objected to, and replace them

with materials of the same species, or of equal quality to that required in vessels of two-thirds the number of years (by their timber material) of the ship's original construction, then such ships to be entitled to be Restored for a period not exceeding *one-half* the number of years originally assigned.

24. If, however, in addition to the above, or at any time during the term of Restoration, the ship be *diagonally* doubled, according to Section 68, then in the case of ships built of the 5 years' grade and under, 2 years additional will be allowed; if built of materials exceeding the 5 and under the 12 years grade, 3 years additional; and if of 12 years' material, 4 years additional will be allowed.*

25. Ships Restored, to be subject to annual survey, and also to a half-time survey, as prescribed in Section 34.

26. Ships of 300 tons or above, Restored according to the foregoing Rule, will not be allowed a Continuation of the Character A at the expiration of the Restoration, unless they be diagonally doubled as prescribed in Section 68. But if they be under 300 tons, and exceeding 20 years of age, to be allowed a Continuation, the bottom planking must either be doubled, as prescribed in Section 68, or else renewed for half the length amidships from the second futtock-heads to the keel, in addition to the other requirements of Section 54.

SECOND RULE.

Section 57. 1. If, at any age of a vessel, the owner be desirous to have his ship Restored to the A character for a longer period than one-half her original classification, she must be subjected to the Special Survey hereafter described, to be held by two Surveyors, one of them to be an exclusive Officer of the Society, and all repairs found necessary must be completed to their satisfaction.

2. If the vessel be 300 tons or above, she must be diagonally doubled, as per Section 68, unless the whole of the planking from the keel to the height of the second futtock-heads be renewed,† when the doubling may be dispensed with.

3. But if she be under 300 tons, and exceeding twenty years of age, she must have the bottom planking renewed‡ for one-half the length amidships from the second futtock-heads to the keel, or be diagonally doubled, as per Section 68.

4. Vessels which have undergone this rule will be entitled to be Restored for a period not exceeding two-thirds the number of years originally assigned (exclusive of any period which might have been previously assigned for doubling), and in addition, if the vessel be at this time diagonally doubled, in accordance with the Rules, Section 68, the term prescribed for such doubling will be allowed.‡

5. When extensive repairs are effected under this rule, and a large proportion of low class materials has been removed and replaced by wood of a higher grade, then, if additional fastenings have been introduced, and the workmanship is of a superior description, the vessel will receive the same consideration with a view to assigning her an improved Class under the Mixed Material Rule, Section 34, as in ships on their original construction.

* As regards ships which have already had a prolonged term for doubling, see Section 68.

† If the whole of the ceiling from the bilges downwards has been removed, and the edges of the outside planking, and its general condition be found satisfactory, or if the outside planking shall have been recently renewed, the Committee will be prepared to give consideration to any application that may be made to them for a relaxation of the requirements above stated.

‡ In the case of Restoration of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

REQUISITES FOR RESTORATION.—SECOND RULE.*

Section 58. 1. The ship must be placed in dry dock or laid on blocks upon ways, so that the keel may be examined.

2. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

3. The hold to be cleared, and proper stages made both inside and outside.

4. All the outside planking from the lower part of the chocks at floor-heads upwards, the stem, knight-heads, hawse-timbers, sternpost, and rudder where exposed; also the shelves, clamps, bilge planks, ceiling and keelsons, to be scraped or dubbed bright.

5. All air-courses and the limbers to be cleared.

6. The upper deck waterways, spirketting, planksheers, sheerstrakes, and topside planks, through which the upper deck shelf-lodging-knee and waterway bolts pass, to be removed.

7. Two planks in each bow and each buttock to be removed.

8. In all cases, the outside planks through which the chain and preventer bolts pass must be removed.

9. If the bolts in the range of the lower deck be *iron*, the outside planks through which they pass must be removed.

10. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the planksheer, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, also one to be driven out from every fourth timber, for half the vessel's length amidships on each side at the bilge, and at such other parts of the vessel as the Surveyors may direct, in order that the state of the treenails and the timbers and planking in the treenail holes may be ascertained.

11. If the fastenings in the range of the lower deck be of *iron*, *not through the outside planking*, one plank on each side is to be removed, so that the condition of these fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

12. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keels in each alternate frame, also through the stem, apron, sternpost, and deadwood.

13. Two strakes of ceiling in the range of the first futtock-heads, and one strake in the range of the floorheads, to be removed on each side all fore and aft.

14. The strake of upper deck plank next the hatchways to be removed all fore and aft.

15. A strake of deck next the waterway or spirketting, on the hold or lower deck beams, to be removed.

16. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

17. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary the salt is to be renewed.

* If the vessel be *Salted* in accordance with Section 37 during repairs under the Second Rule for Restoration, she will be allowed the advantage of the Rule for Salting.

19. The condition of the oakum and caulking to be ascertained.
20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.
21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.
22. When in the state above described, the ship to be submitted to a special survey and examination, at which the attention of the Surveyors is to be particularly directed to the state of the upper deck and comings, the upper and lower deck binding bolts, whether of iron or copper, and the planks through which they pass; the beams, stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, innerpost, and transoms; the floors, keelson and keel; the rudder and all its parts and hangings; the planking outside and inside and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.
23. If, after the above examination, the Owner should consent to take out all planks, timbers, beams, knees, fastenings, and other parts that may be found defective, or objected to, and replace them with materials of the same species or of equal quality *to that required in vessels of two-thirds the number of years (by their timber material) of the ship's original construction*, and she be *diagonally doubled* as per Section 68, or *planking renewed as required by Section 57*, then she will be entitled to be restored for a period not exceeding two-thirds the number of years assigned originally, and the term allowed for doubling, viz., 2 years additional if built of wood materials of the five years' grade and under; 3 years additional, if built of materials exceeding the 5 years' and under 12 years' grade; and 4 years additional, if built of 12 years' material or above.
24. Ships thus Restored to be subject to annual survey, and to the half-time survey, as prescribed in Section 34.

CONTINUATION ON RESTORATION.

Section 59. 1. Ships which have been doubled when *Restored* (or in which the requirements of the last paragraph, Section 56, or the second and third paragraphs of Section 57, have been complied with) shall be entitled to Continuation, subject to the same conditions of survey and examination as are prescribed for ships proposed to be Continued at the expiration of the period first assigned to them (Section 54); but, in like manner, the term of such extended Continuation shall be limited to a period not exceeding one-third or two-thirds of the number of years for which the ships may respectively have been *Restored* (exclusive of time allowed for doubling), without any reference whatever to the period originally assigned to them.

EXPIRATION OF CHARACTER.

2. At the termination of the several periods assigned to ships for remaining on the Character A, or A in Red, they will have the word "*Expired*" inserted against them; and, if not surveyed prior to the reprinting of the Register Book, they will appear without any character.*

* The terms of years assigned to ships on the Character A, launched *previously to the 1st July, 1859*, also of ships launched during the *first six months of the years 1860, 1861, 1862, and 1863*, will expire on the 31st December of the last year of the periods assigned to them respectively.

The terms assigned to ships launched during the *last six months of the years 1859, 1860, 1861, and 1862*, will expire on the 30th June next after the last year of the periods assigned to them respectively.

In the case of ships launched on and after the 1st July, 1863, the period originally assigned to them on the A character, will in every case *date from the month in which the vessel may be launched, and will expire at the end of the corresponding month in the year at which the period assigned terminates.*

3. But if, during the *last year* of the period assigned to them, the Owners of a ship shall, in consequence of her being about to proceed on a distant foreign voyage, apply to have her surveyed for Continuation on the letter A, or for the Character A in Red, a special survey shall be held conformably to the Rules, Section 54 or 60, as the case may be; and if from the report of such Special Survey, the ship shall appear to be in all respects in a sound and efficient state, such as is required by those Rules, the Committee shall, from the period at which the ship's Character would terminate, continue on the letter A, or will assign to her the Character A in Red in accordance with the Rules referred to.

SHIPS CLASSED A, IN RED.

Section 60. 1. Ships found on survey to be of a superior description, being fit for the safe conveyance of dry and perishable goods to and from all parts of the world, subject to the following conditions, shall be classed A in Red, as the Second description of the First class.

2. In all cases in which the Owner may claim this character, the ship must undergo a special survey by two Surveyors (to be appointed in every instance by the Committee), one of whom shall be an exclusive Officer of the Society. (*See also Section 52 for Ships not built under Survey.*)

3. Then if the following Survey, designated Survey No. 1, be complied with within twelve months of the expiration of the Character A, either on original Classification, Continuation, or Restoration, one-third of the number of years assigned originally, or such as might have been assigned, will be granted from the date of such Survey; *but, if this Survey be not complied with within the above stated time, the period named will commence from the expiration of the original Classification, Continuation, or Restoration.*

4. *If after the expiration of the period assigned, or which might have been assigned, under the First Survey, the character A in red be sought, the following Survey, designated No. 2, must be complied with, when a period of two-thirds the number of years assigned originally, or such as might have been assigned will be granted from the date of such Survey.*

5. *The character A in red for a period of two-thirds the number of years originally assigned may, however, be obtained at ANY time, provided the requirements of Survey No. 2 be complied with.*

6. In the repair of vessels for the above character, no materials may be used of a description inferior to those allowed in new ships for the six years' grade, except in the case of vessels originally classed for a shorter period than six years, when materials equal to those used in the original construction will be permitted.

FIRST SURVEY FOR A, IN RED.

7. The ship must either be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

8. To be scraped or dubbed bright from the light water-mark upwards, including the planksheers and waterways, so as to expose the surface of the plank to view.*

* If the ship has been sheathed with wood over felt within a period of five years, and the plank from the light water mark upwards shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained, and favourably reported upon by the Surveyors, the stripping from the light water-mark upwards may, on application to the Committee, be dispensed with, provided the sheathing which covers the raft-ports and binding-bolts, and a strake of sheathing all fore and aft on each side under the wales be removed, and listings of sheathing be cut out at hood ends, and the planking, fastenings, and caulking so exposed shall prove to be in good condition; but, whenever the sheathing is removed, the outside planking is to be scraped or dubbed bright and examined as prescribed by the above Rules.

If the ship has been sheathed with metal within a period of two years, and it shall appear to the Surveyors that stripping from the light water-mark upwards may be dispensed with, the case will receive due consideration on application to the Committee.

9. The hold to be cleared, and proper stages to be made both inside and outside.
10. All air-courses and the limbers to be cleared.
11. The condition of the timbers of the frame to be further ascertained by a *new* listing not less than 4 inches wide, being *cut* out of the ceiling at each end of the hold on each side, between the keelson and air-course under the hold-beam clamp, for one-fifth the entire length of the ship.
12. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the planksheers, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers, and planking in the treenail holes.
13. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.
14. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.
15. All treenails, bolts, and listings, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.
16. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, sternpost, and deadwood.
17. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.
18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.
19. The condition of the oakum and calking to be ascertained.
20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.
21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.
22. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and comings; the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the planksheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, inner-post, and transoms; the floors, keelsons, and keel; the rudder and windlass; the planking outside and inside and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.
23. The ship to be efficiently repaired with suitable materials.
24. The term for which a vessel may be assigned the Character A in Red, upon a compliance with the foregoing requirements, will not exceed one-third the number of years of that assigned originally, or

such as might have been assigned, subject to the usual annual survey, and also to the half-time survey, as prescribed in Section 34.

25. If, however, in addition to the above, the ship be *diagonally* doubled according to Section 68, then, in the case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under the 12 years' grade, will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional,* provided a strake all fore and aft at the upper edge of the doubling, or the plank-sheers be removed.

SECOND SURVEY FOR A, IN RED.

26. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined. (*See also* Section 52 for ships not built under Survey.)

27. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.†

28. All the outside planking, from the light water-mark upwards, including the plank-sheers and waterways, to be scraped or dubbed bright.

29. The hold to be cleared, and proper stages made both inside and outside.

30. All air-courses and the limbers to be cleared.

31. The condition of the timbers of the frame to be further ascertained by the removal of all the treenails in one strake in the topsides fore and aft, on each side, and by the removal of two planks on each side above the wales, except in vessels of 200 tons, or under, when the removal of *one* plank on each side will be deemed sufficient.

32. In addition, a plank to be removed in each bow and each buttock.

33. One treenail to be driven out from every alternate frame or fourth timber, between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

34. If the whole of the treenails from the light water-mark upwards have to be renewed, the removal of a plank in each bow and buttock will be sufficient, provided the timbers in the treenail holes be examined and found in good condition.

35. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

36. If the fastenings in the range of the lower deck be of iron, not through the outside planking, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they

* In the case of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

† If the ship has been sheathed with wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with; provided that the sheathing, which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed shall prove to be in good condition; but, whenever it is removed the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.

37. Where the middle-line bolts are of iron, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, sternpost, and deadwood.

38. Plank, or a new listing of ceiling, of sufficient breadth (not less than four inches wide), at the discretion of the Surveyor, to be cut out of the ceiling in the range of the floor-heads, or at such height as may in the judgment of the Surveyors best expose the timbers of the frame to view, at each end of the hold for one-fifth the entire length of the ship, and for the remaining three-fifths of the ship's length the state of the timbers to be ascertained by driving out a treenail from every fourth timber in one or other of the strakes of the bilge planking. If the Shipowner should prefer it, planking may be removed *outside*, at each end of the ship, in the range of the floor-heads.

39. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the waterways on each side to be taken out, except where it is covered by a poop, or a forecastle, and where this exception arises the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding and be found good.

40. All treenails, bolts, listings, and planking removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

41. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

42. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

43. The condition of the oakum and caulking to be ascertained.

44. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

45. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.

46. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and comings; the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the planksheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbres, knight-heads, breast-hooks, sternposts, inner-post, and transoms; the floors, keelsons, and keel; the rudder and windlass, the planking outside and inside, and treenails, the frame and inner surface of the outside planking, where they can be seen, and the sheer and general form of the ship.

47. The ship to be efficiently repaired with suitable materials.

48. To entitle them to continue this Character, such ships will be required, in addition to the usual annual survey, to undergo the half-time survey as prescribed in Section 34, and to undergo a special re-survey as prescribed above, within a period (from the date of the last special re-survey) not exceeding *two-thirds* of the several terms of years originally assigned to them, or earlier, if, in the judgment of the Surveyors, upon a careful examination of the ship, the same shall appear to them to be necessary.

49. If, however, in addition to the above, the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under the 12 years' grade, will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional.*

SHIPS CLASSED Æ.

Section 61. 1. Ships that have passed the prescribed age for the A Character, but have not undergone the repairs which would have entitled them to be Continued or Restored; or having been Continued or Restored, or classed A in Red, and the additional period thus assigned expired, and also such ships as have never had an original character, which shall be found on survey fit for the conveyance of dry and perishable goods on *shorter voyages*, and for the conveyance of cargoes not in their nature subject to sea-damage on any voyage, shall be distinguished by the diphthong Æ, upon compliance with the undermentioned Survey. (See also Section 52 for Ships not built under Survey.)

SURVEY.

2. The ship to be placed on blocks, so that the keel and bottom may be seen and properly examined and the caulking tested.

3. The hold to be cleared and proper stages made both inside and outside.

4. The limbers and all air-courses to be cleared.

5. A listing to be cut out of the ceiling, not less than four inches wide, in the range of the floor-heads or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, at each end of the hold on each side for one-fifth the extreme length of the vessel.

6. The outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defect.

7. Bolts of lower deck (if of iron) in number not less than six on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship.

8. The attention of the Surveyors is to be then particularly directed to the state of the upper or main deck and comings, the upper and lower deck bolts, *whether of iron or copper*, and the outside planks through which they pass, and to all other parts of the ships, so far as they can be examined.

9. The windlass to be unhung and its wood lining sufficiently stripped for examination; and the chain cables to be removed from the lockers and ranged, and, with the anchors, masts, spars, and general equipment, examined so as to be satisfactorily reported upon.

10. *Where the middle-line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, sternpost, and deadwood.

11. If the Æ Character be then assigned, it shall be continued, subject to an annual survey for a period not exceeding four years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.†

* In the case of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

† For doubling of ships of the above Class, see Section 68.

BRITISH NORTH AMERICA AND ALL FIR SHIPS.*

Section 62. 1. Ships built in the British North American Colonies, and all ships wherever built, the frames of which are composed of *Fir*, of 400 tons and above, shall, in order to entitle them to be classed in the Register Book of the Society, be secured in their bilges by the application of iron knee riders, or hanging-knees and riders to cover the joints of the floor and futtock-heads, to extend from the height of the hold beams to the floors so as to receive not less than two bolts in a substantial part of the floors.

2. The number of iron knees and riders to be not less than one of each to every hold or lower deck beam on each side. The knees to be connected with riders or not, at the option or convenience of the Owners, but if not so connected, the side arms of the knees are to be of the length and to be fastened as prescribed in Table F. "*Jumped knees*" will not be allowed.

3. The number of knees to each deck, and of riders, also their dimensions, and number of bolts, are fully explained in Table F.

4. All ships built in the Colonies will be considered as "iron fastened" in their centre lines, unless it shall be satisfactorily shown to the contrary, either by the exposure of some of the bolts or by a certificate to be produced from the Builders.

5. Ships which proceed to sea *without being fastened with the iron knees and riders prescribed by the Rules,*† will have *One Year deducted* from the period to which they would otherwise be entitled to be classed in the Register Book.

BRITISH NORTH AMERICAN BUILT SHIPS.

Section 63. 1. All British North American built ships, which have gone, or may go off the List of Ships of the A character, or which may be of an age exceeding the period for which they might have had claims to be put upon that grade (whether classed or not), shall, as from time to time they come under examination, be subjected to a careful Survey, to be made by one of the Surveyors to this Society;—and no further Character shall be assigned them unless a Survey shall be held as follows; either by removing planking *outside*, equal in breadth to an entire strake for one-fifth the length of the vessel forward and aft on both sides, or by cutting listings *inside* five inches wide to the same extent in the fore and aft bodies in line with the upper turn of bilges, or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, and for the remaining three-fifths of the vessel amidships the state of the timbers to be ascertained by driving out a treenail in every fourth timber in one or other strake of bilge planking. A special report of the state of these timbers, and of the general state and condition of the upper deck fastenings, waterways, spirketting, planksheers, topsides, upper deck with its appendages, lower deck fastenings, wales, counter, plank and treenails outside to the water's edge, rudder, windlass and capstan, beams and breast-hooks, shall then be transmitted by the Surveyor to the Committee; and on the receipt of such report the character shall be assigned.

2. *If, in addition to the requirements contained in Section 61, the above Survey be complied with and the AE Character be assigned, it shall be Continued, subject to an annual Survey, for a period not exceeding four years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.*

* See also Section 39, paragraph 5.

† This applies not only to British North American ships, but to all wooden vessels.

SHIPS CLASSED E.

Section 64. Will comprise all ships which shall be found on Survey fit for the conveyance of cargoes not in their nature subject to sea-damage *on any voyage*.

Section 65. 1. To entitle vessels to this Character they must be subjected to the following Survey.

2. To be placed on blocks so that the keel and bottom may be examined, and the caulking tested. Treenails, not less than twelve on each side, to be driven out at various parts of the ship, for the purpose of ascertaining their condition and that of the timbers and planking through which they pass.

3. The windlass to be examined, and the chain cables to be ranged, and the equipment generally examined and reported upon.

4. If the E Character be then assigned, it shall be Continued, subject to an annual survey, for a period not exceeding three years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.*

Section 66. The Classification of Ships with the Character I. is discontinued.

CAULKING.

Section 67. 1. The Bottom of every ship is to be CAULKED† once in every five years, unless wood-sheathed and felted, and then once in every seven years, except in the case of *Teak-built ships*, upon which a Special Survey may have been requested, and the Surveyors having ascertained, by the removal of a strake of sheathing fore and aft under the wales, and a strake at the first futtock-heads, and by causing listings to be cut out at the hood ends, that such caulking is not required, the same may then be dispensed with.

2. If any ship shall be stripped within the periods above mentioned, her bottom is to be caulked, *if necessary*. (See Section 70.)

DOUBLING.

Section 68. 1. In all cases in which ships may be doubled, doubling of not less than the thickness hereinafter mentioned will be required, the same to be properly wrought and fastened as follows: in every instance the doubling is to be at least single fastened either with treenails or with bolts,‡ and a through-bolt in every butt. If treenails be used, every treenail must, if practicable, be a through fastening; and, if bolts be used, then one-sixth of them from the lower part of the bilge upwards must be through and clenched on the ceiling in addition to the butt bolts. In all cases of doubling, the rudder braces are to be removed.

* For doubling of Ships of the above Class, see Section 68.

† In cases where ships have been doubled with doubling of less thickness than is required by, or not fastened in accordance with, the Rules, it will not be imperative that such doubling be stripped at the expiration of seven years, as required for ordinary sheathing; but if, upon Survey, the doubling be found in good condition, the period for its remaining on may be extended, with the sanction of the Committee, to a term not exceeding ten years, provided the doubling below the wales be copper or yellow metal fastened or treenailed.

‡ In ships hereafter doubled and sheathed with copper or yellow metal, if the doubling be fastened exclusively with bolts, the same must be of copper or yellow metal.

If the doubling be fastened with treenails and bolts, as described in the above section, and the bolts be of iron, the vessel must be subjected to a Special Survey, and bolts at the discretion of the Surveyor be driven out to ascertain their condition; such surveys to be held within periods not exceeding three years, and whenever the copper or yellow metal sheathing is stripped.—6th July, 1876.

2. The throat bolts of iron knees, and the bolts of iron hooks, crutches, and pointers, must be renewed through the doubling.

3. The thickness of the doubling for the wales and bottom, on ships

Under 400 tons to be not less than	...	...	...	2 inches
of 400 „ and under 600 tons	...	...	...	2½ „
of 600 „ and above	...	...	...	3 „

4. On the topsides of ships not exceeding 300 tons, the thickness may be 1½ inches.

5. No ship hereafter doubled shall be entitled to the Character A, or A in Red, unless at the time of doubling it be ascertained, in either case, that the frame is capable of securely retaining the fastenings, *by one treenail being driven out in every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of treenails and timbers, and of the planking in the treenail holes*, or should the state of the treenails indicate defective timbers, or should the outside planking be bolt-fastened, then, by cutting out listings or plank at the discretion of the Surveyor.

6. Before doubling, the original fastenings in the outside planking and the rider bolts should be ascertained to be in efficient condition, or be made good, but all treenails, from *the upper part of chocks at second futtock-heads to the lower part of chocks at floor-heads to be renewed with through treenails of hard wood for at least half the length of the ship amidships*, unless the Surveyors, by having a sufficient number driven out, fully satisfy themselves that they are well made, tightly driven, and in good condition.

DIAGONAL DOUBLING.

7. If the doubling be applied diagonally, on the wales and bottom, it will be allowed to be of the following thicknesses, viz. :—

In ships under 500 tons	...	...	...	1½ inches
„ of 500 tons and under 1,000 tons	...	...	...	2 „
„ 1,000 tons and upwards	...	...	...	2½ „

8. *Diagonal* doubling on ships is to be fastened as under, viz. :—

9. If worked not above 11 inches broad, it may be single fastened with a through bolt at every butt, every *fifth* fastening to be a through bolt or a through treenail of hard wood; the distance between these through fastenings not to exceed 4 ft. 6 in. The remaining fastenings to consist of through treenails or two long and two short dump bolts; the length of the short dumps may be half an inch less than the combined thickness of the doubling and the original outside plank, and that of the long dumps to be not less than the thickness of the doubling added to twice the thickness of the original outside plank.

10. At the upper edge of the doubling, which is to be sufficiently high to enable the butt bolts of the diagonal planks to pass through the lower deck spirketting, a strake of planking is to be taken out fore and aft, and a strake is to be worked in its place, on the timbers, sufficiently thick to project to the outside of the doubling. The butts of the diagonal doubling are then to be rabbeted into this thick strake; or a fore and aft strake of doubling may be worked below the thick strake, and be rabbeted into it, and the butts of the diagonal doubling may be butted against this fore and aft strake. Or, if the strake of planking is not removed and the thick strake is not worked, there must be at the upper ends of the diagonal doubling a fore and aft strake, having its upper edge let into the original plank sufficient to form a caulking seam, say

not less than $1\frac{1}{2}$ inches. The lower ends of the diagonal doubling to be worked against two strakes of fore and aft doubling, the lower edge of the lower strake being rabbeted into the keel, and to be not less in thickness than one and a half times the thickness of the doubling. All diagonal doubling to be of rock elm or of equally suitable material, and be wrought on hair felt.

EXTENSION OF CLASS FOR DIAGONAL DOUBLING.

11. Ships diagonally doubled in conformity with the Rules, after the expiration of twelve months from the date of launching, shall be allowed an extended period of classification to the extent described hereafter.

12. Also ships surveyed for Continuation, Restoration, and the Character A 1 in Red, which shall be diagonally doubled in conformity with the Rules, shall, on account of such doubling, be allowed an extension of the term otherwise assigned to them as under, viz. :—

13. Ships built of wood materials of the 5 years' grade and under, shall be allowed 2 years additional on account of being doubled diagonally ; those built of materials exceeding the 5 and under the 12 years' grade, shall be allowed 3 years additional ; and those built of 12 years' materials, 4 years additional.

14. To entitle ships to the advantages of this Rule when surveyed for Continuation, under Survey No. 2, Section 54, or for A in Red under Second Survey, Section 60, it will be necessary, in addition to the other requirements of the Rules, that in *flush-decked Vessels* the planksheer be removed on each side all fore and aft, so as to expose the heads of the timbers and the back of waterways to view ; also that a strake of upper deck next the waterway be taken out all fore and aft, and the beams of the decks below be tested by boring and sounding. But in ships having a poop and forecastle it will be necessary to remove the planksheer on both sides from the poop to the forecastle, and the mouldings in continuation of the planksheer forward and aft ; or a portion of a strake of topside planking from the fore part of the poop aft, and from the after part of the forecastle forward ; but it will not be necessary to remove planking of topsides from poop to forecastle where the planksheer has been removed, if the timbers thus exposed are in good condition ; nor the strake of deck abaft the first beam within the poop and before the first beam within the forecastle, provided the beams are tested by boring and sounding and be found good.

15. If a ship be doubled at the time she undergoes the Continuation Rule, 1st Survey, or the 1st Rule for A in Red, the removal of a strake all fore and aft at the upper edge of the doubling may be substituted for the removal of the planksheer.

16. A similar relaxation of the Rule will, upon special application to the Committee, be allowed in the case of spar-decked ships.

FURTHER EXTENSION OF CLASS FOR DIAGONAL DOUBLING.

17. Ships which have been diagonally doubled in conformity with the Rules, Section 68, and have received an extension of class for the same, may, at a subsequent period, either on the expiration of the period of continuation under the second rule, or of Restoration, or of second continuation upon Restoration, or second Survey for A 1 in red, receive a *further extension* of class for diagonal doubling, provided the following Survey be complied with, and the vessel be found or placed in good and efficient condition.

18. The period of this *further extension* to be 3 years in the case of vessels built of materials of the 12 years' grade and above, and 2 years in the case of vessels where the timber materials are below the 12 years' grade.

SURVEY.

19. The ship to be placed on blocks in dry dock, or on ways, so that the keel and bottom may be seen and properly examined (unless she has been thus surveyed by the Society's officers within the previous twelve months); the hold to be cleared, and proper stages made both inside and outside; the limbers, and all air-courses to be cleared; and, if the ship has not already got the air-courses described in Section 37, they are now to be made; the outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defects; bolts of lower deck (if through of iron) in number not less than three on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship, and all parts of the ship, and the equipment to be thoroughly examined, in order to ensure the vessel being in good and efficient condition, and worthy of the extension of class herein contemplated.

20. Such Ships to be marked in the Register Book thus:—dia. d. 3 yrs. or 2 yrs., as the case may be.

DOUBLING OF VESSELS CLASSED *Æ* and *E*.

21. All vessels of the *Æ* or *E* class, or vessels unclassified, which may be found on Survey to be, from *local* defects, in a condition requiring considerable opening out and consequent repairs, to entitle them to a class in the Register Book, or to continue on their class, may be rendered eligible for classification, or for the *Æ* character, provided they be diagonally doubled, the thickness of the same being from one inch in thickness and upwards, according to the size of the vessel.

22. In all such cases, however, the Local Surveyor should forward a report, setting forth the condition of all parts of the vessel, and the mode of doubling proposed to be adopted, for the sanction of the Committee.

23. A careful examination is to be made of the condition of the original fastenings, and the planking of the bottom, &c., before the doubling is fitted, and the Surveyors are to satisfy themselves that the timbers of the frame and planking are sufficiently sound to receive the fastenings.

24. When the doubling is under two inches in thickness it may be fastened with short bolts, spikes or nails, galvanized, on the alternate edges not exceeding twelve inches apart; the length of the bolts, spikes or nails, may be one inch less than the combined thickness of the doubling and outside planking with longer intermediate bolts in the butts and about five feet apart, driven into the timbers of the frame.

25. When the doubling is two inches in thickness or above, in addition to the above fastenings, the butt bolts must be through and clenched.

26. The doubling in all cases is to be rabbeted into the stem, sternpost, and keel, and a strake of longitudinal doubling is to be fitted adjoining the keel, and to be one-half an inch thicker than the diagonal doubling, if the latter be two inches or less in thickness.

27. Should the *Æ* character be then assigned, the same will be continued, subject to annual Survey, provided once in every four years the keel and bottom be surveyed, and the caulking tested, and the hold cleared; the windlass unhung and chain cables ranged, and the equipments and general condition of the vessel be found satisfactory. (For periodical Surveys of ships classed *E*, see Section 65.)

28. Where modifications are desired, Shipowners may submit their proposals for the approval of the Committee through the resident Surveyor.

IRON-FASTENED SHIPS.

Section 69. All ships, although iron-fastened (except as hereinafter mentioned), shall be classed in the same manner as copper-fastened ships, so long as they remain unsheathed with copper, provided they are, in all other respects, constructed in accordance with the Rules; but, when sheathed with copper over the iron fastenings, the words "Coppered over Iron Bolts" shall be added to the Character in the Register Book, and continued until the ship be thoroughly copper-fastened.

SHIPS BUILT IN INDIA.

Section 70. Ships built in India, although fastened with iron, shall be permitted to be copper-sheathed without any mark being placed in the book, provided the bottom be felted or chunamed and wood-sheathed, and subjected to a careful examination of the iron fastenings on every occasion on which the sheathing is stripped off, for which purpose some of the bolts and nails are to be taken out of the lower part of the bottom, and to be seen by the Surveyor; but no such ship shall be permitted to continue either on the A or on the A in Red class for a longer period than one-half the number of years beyond the term originally assigned for her remaining on the A Character, unless the bottom shall have been doubled, or the whole of the iron fastenings taken out or properly secured, and the bottom refastened with bolts, or treenails, or both, including the middle line, breast-hook, and crutch bolts. (*See Section 67.*)

RUDDER, PUMPS, WINDLASS, HAWSE-PIPE, &c.

Section 71. 1. The rudder, pumps, windlass, or capstan, scuppers, hawse-pipes, chain-plates, and side-lights to be good and efficient; and the windlass, if of wood, is in all cases to have a through square iron spindle, ranging from $2\frac{1}{2}$ to 5 inches square, according to tonnage.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass, or capstan.

EQUIPMENT.

Section 72. 1. All vessels are required to have their masts, spars, and rigging in good order, and sails in sufficient number and in good condition.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, properly tested at a *public machine*, in number and length, as set forth in the Table, No. 22, annexed. (*See also Section 32.*)

3. In cases, however, where anchors and chain cables are manufactured abroad and supplied to *foreign owned vessels*, and testing certificates are furnished setting forth that the anchors and chain cables have been tested at a Government machine, or a machine under the control of a municipal body, or a similar responsible body, such certificates will be accepted as complying with the requirements of the Rules, for obtaining the figure 1, provided the remaining requirements of Table 22 be complied with, but in these cases the record of A.&C.P. will not be made in the Register Book.

4. A Certificate of all Chains and Anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

Section 73. The length and condition of the Chain Cables are to be ascertained by removal from the lockers on every Special Survey for Classification.

Section 74. In all cases where hempen cables are used, one-sixth more in length will be required.

Section 75. BOATS :—All vessels under 150 tons to be provided with one good Boat ; and every vessel of 150 tons and above to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of *all* vessels.

Section 76. 1. The efficient state and condition of the whole of the ship's equipment will be designated by the Figure 1 ; and where the same is found insufficient in quantity, or defective in quality, by a dash thus — following the character assigned to the ship.

DEFECTIVE EQUIPMENT.

2. In the case of a steam-vessel already classed, of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel, in the Register Book ; but, where in the opinion of the Committee the Machinery or Boilers are deemed so far inefficient and defective as to imperil the vessel's safety, the figure 1 will be withheld, and a red ring inserted in place thereof ; and, in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the figure 1 for equipment ; as described in the foot-note on the page of the Register Book and in the Key thereto ; and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See also* Section 78.)

SHIPS NAVIGATED BY STEAM.

Section 77. Steam ships are to be subject to the same periodical surveys as sailing vessels, and whenever the boilers are taken out the vessel is to be submitted to a particular and special Survey, in order to ascertain her general condition. (*See* Section 78.)

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 78. 1. In vessels propelled by steam the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them, in the manner and form, No. 8 annexed. The Committee will thereupon, if found satisfactory, grant a certificate, and insert in the Register Book the notification "LMC." in red (*i.e.* LLOYD'S MACHINERY CERTIFICATE) indicating that the machinery and boilers are certified to be in good order and safe working condition. (*See* Section 76.)

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS.

2. On the different parts of the engines during erection.
3. On the sea connections while being fitted to the vessel.
4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c., while being fitted.
5. Testing the boilers by hydraulic pressure.
6. When engines and boilers are being fixed on board the vessel.
7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under special survey, the machinery and boilers must also be constructed under special survey.
9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ in red will be noted, thus: "✠ LMC." or "✠ NE&B," or "✠ NB."
10. In order to facilitate this inspection, the plans of the machinery and boilers should be examined, and from them the working pressure fixed.
11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.
12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 44.)
14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.
15. The boilers, together with the machinery, to be inspected at different stages of construction.
16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.
17. Two safety valves to be fitted to each boiler and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lb. per square inch, the safety-valves may be loaded to 5lbs. above the working pressure. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case is to exceed 10 per cent. of the working pressure.
18. An improved safety valve is also to be fitted to the superheater.
19. In Winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.
20. Each valve is to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles are to extend through

the covers and to be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop valves are to be fitted so that each boiler can be worked separately.
22. Each boiler is to be fitted with a separate steam-gauge, to accurately indicate the pressure.
23. Each boiler is to be fitted with a blow-off cock independent of that communicating with the sea.
24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyors.

STEEL BOILERS.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*See Circular No. 438*, page 83*):—

1. The material of stays and of plates not exceeding 1 inch in thickness is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.
In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*
It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82 degrees Fahrenheit.
2. Steel rivets are to be considered as part of the material, and, in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.
3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.
4. All the holes in steel boilers should be drilled; but, if they be punched, the plates are to be afterwards annealed.
5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.
6. No steel stays are to be welded.
7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed pumps each capable of supplying the boilers; the pumps, &c., are to be so arranged that either can be overhauled whilst the other is at work.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for Iron Boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

27. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed pump and one bilge pump will be deemed sufficient, provided they are of adequate capacity.

29. A bilge injection or a bilge suction to the circulating pump is to be fitted.

30. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel. The mud boxes and roses in engine-room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water. This pump is to be so fitted as to pump from each compartment, to deliver water on deck, and, if no hand pump is fitted in engine-room, it must be fitted to be worked by hand.

32. All steam and feed pipes are to be of copper, and of a thickness to the satisfaction of the Surveyor.

33. All discharge pipes are to be, if possible, carried above the deep-load line, and to have discharge-valves fitted in an accessible position.

34. No pipes are to be carried through the bunkers without being properly protected.

35. Bilge suction pipes are to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough turned and finished.

Cast steel shafts to be subjected to the following tests, viz. —

A tensile test to be made to show that the material has not a greater tenacity than 30 tons per square inch, and a test piece to be cut from the casting which will permit of being bent cold through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.

37. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, *see* the formula in paragraph 45.

COCKS, PIPES, AND SEA CONNECTIONS.

38. With a view to ensuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and in vessels having *new engines or boilers* :—

39. All sea-cocks are to be attached to Kingston valves of a height sufficient to lift them up to the level of platforms.

40. Cocks and valves connecting all suction pipes are to be fixed above the stoke-hold and engine-room platforms.

41. The arrangement of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement is to be reported to the Committee.

SPARE GEAR.

42. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod top-end bolts and nuts	1 set of piston springs (where common springs are used)
2 connecting rod bottom-end bolts and nuts	A quantity of assorted bolts and nuts
2 main-bearing bolts	Iron of various sizes.
1 set of coupling bolts	
1 set of feed and bilge pump valves	

43. In addition to the foregoing, the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft	1 pair of cross-head brasses
Propeller shaft	1 set of link brasses
Propeller, or a full set of blades	1 cylinder escape valve and spring
Stern bush, or lignum-vitæ lining for bush	1 eccentric strip complete
Air pump rod	6 junk ring bolts
Circulating pump rod	6 cylinder cover bolts
H.P. valve spindle	4 valve chest cover bolts
L.P. valve spindle	2 dozen boiler tubes
1 set of check valves	3 dozen condenser tubes
1 pair of connecting rod brasses	1 set of safety valve springs.

**RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN
NEW BOILERS.**

CYLINDRICAL SHELLS.

The strength of circular shells to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where **C** = co-efficient as per following table.

T = thickness of plate in inches.

D = mean diameter of shell in inches.

B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$B = \frac{n \times a}{p \times T} \times 90$ with iron rivets in iron plates with drilled holes.

$B = \frac{n \times a}{p \times T} \times 85$ with steel rivets in steel plates.

$$B = \frac{n \times a}{p \times T} \times 70 \text{ with iron rivets in steel plates.}$$

(In case of rivets being in double shear, $1.75a$ is to be used instead of a .)

where p = pitch of rivets.

d = diameter of rivets.

a = sectional area of rivets.

n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$ -inch thick and under.	For Plates $\frac{3}{4}$ -thick and above $\frac{1}{2}$ -inch.	For Plates above $\frac{3}{4}$ -inch thick.	
Lap Joint, Punched Holes.....	155	165	170	
Lap Joint, Drilled Holes	170	180	190	
Double Butt Strap Joint, Punched Holes	170	180	190	
Double Butt Strap Joint, Drilled Holes	180	190	200	

STEEL BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{3}{8}$ -thick and under.	For Plates $\frac{9}{16}$ thick and above $\frac{3}{8}$.	For Plates $\frac{3}{4}$ -thick and above $\frac{9}{16}$.	For Plates above $\frac{3}{4}$ -thick.
Lap Joints	200	215	230	240
Double Butt Strap Joints	215	230	250	260

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the above tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise fened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the weakest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, and for all stays which are welded, 6,500 lb. per square inch; for unwelded stays above $1\frac{1}{2}$ inches effective diameter, 7,000 lb. per square inch.

Steel Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, 8,000 lb. per square inch; for stays above $1\frac{1}{2}$ inches effective diameter, 9,000 lb. per square inch. No steel stays are to be welded.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch.}$$

where **T** = thickness of plate in sixteenths of an inch.

P = greatest pitch in inches.

C = 90 for plates $\frac{7}{16}$ thick and under fitted with screw stays with riveted heads.

C = 100 for plates above $\frac{7}{16}$ fitted with screw stays with riveted heads.

C = 110 for plates $\frac{7}{16}$ thick and under fitted with screw stays and nuts.

C = 120 for plates above $\frac{7}{16}$ fitted with screw stays and nuts.

C = 140 for plates fitted with stays with double nuts.

C = 160 for plates fitted with stays with double nuts, and washers at least $\frac{1}{2}$ thickness of plates and a diameter of $\frac{2}{3}$ of the pitch, riveted to the plates.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L - P) \times D \times L} = \text{working pressure in lbs. per square inch.}$$

where **L** = length of girder.

P = pitch of stays.

D = distance apart of girders.

d = depth of girder at centre.

T = thickness of girder at centre. All these dimensions to be taken in inches.

C = $\begin{cases} 6,000, & \text{if there is one stay to each girder.} \\ 9,000, & \text{if there are two or three stays to each girder.} \\ 10,200, & \text{if there are four stays to each girder.} \end{cases}$

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89,600 \times T^2}{L \times D} = \text{working pressure in lb. per square inch.}$$

where 89,600 = constant.

T = thickness of plates in inches.

D = outside diameter of furnace in inches.

L = length of furnace in feet. If rings are fitted, the length between rings to be taken.

The pressure in no case to exceed $\frac{8,000 \times T}{D}$

The strength of the ribbed furnaces (with ribs 9 inches apart) and corrugated furnaces (corrugations $1\frac{1}{2}$ inches deep) to be calculated from the following formula :—

$$\frac{1000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch,}$$

where **T** = thickness of plates in sixteenths of an inch.

D = (for ribbed furnaces) outside diameter of plain part.

D = (for corrugated furnaces) greatest diameter of furnaces in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any case where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULE FOR DETERMINING SIZES OF SHAFTS.

45. The diameters of crank and straight shafts are to be not less than those given by the following formula :—

$$d = \sqrt[3]{\frac{P S D^2}{C}}$$

in which

d = Diameter of shaft in inches.

P = Absolute pressure in lbs. per sq. inch.

S = Stroke in inches.

D = Diameter of Low Pressure Cylinder in inches.

C = Constant according to the following table.

	For Crank and Propeller Shafts.	For Intermediate Shafting.
Double Expansion Engines ...	10,800	12,300
Triple Expansion Engines.....	18,800	21,200
Quadruple Expansion Engines.	20,800	23,500

PERIODICAL SURVEYS OF MACHINERY. ENGINES AND BOILERS. (See N.B. at foot.)

46. The machinery and boilers of all steam ships are to be surveyed annually, if practicable, and in addition are to be submitted to a Special Survey every four years.

47. At these Special Surveys the propeller, stern-bush, and fastenings of the sea connections are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyors, the stern shaft is to be drawn and examined, at least once in four years, and more frequently if deemed necessary by the Surveyors.

48. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

49. The sea connections and arrangements of cocks, pipes, bilge suctions, roses, &c., are to be examined.

50. The boilers and superheaters are to be examined internally and externally, and if deemed necessary.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE of PERIODICAL SURVEYS required by the Rules, or when Repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

51. The safety valves are to be examined and set to the safe working pressure.

52. If satisfactory, these surveys will be recorded in the Register Book thus: "L.MC. 5,88" *in red*; or "B.&MS. 5,85" *in red*.

53. "L.MC." (LLOYD'S MACHINERY CERTIFICATE) with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

54. "B.&MS." (BOILERS AND MACHINERY SURVEYED) with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

55. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

56. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

57. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

58. The safety valves are to be examined and set to the safe working pressure.

59. If satisfactory, these surveys will be recorded in the Register Book thus: "B.S.5,88" *in red*.

60. "B.S." (BOILERS SURVEYED) with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

61. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

62. The boilers and machinery are to be considered as part of the equipment, and, unless the Surveyors are satisfied of their efficiency, the figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See also* Section 76.)

Section 79. HULL:—The Surveyors are directed to examine and report the scantling of timbers, plank and fastenings, and to state where built, and by whom, in the same manner as directed for sailing vessels.

Section 80. The Surveyors are required to report the number, size, length, fastenings, and mode of arrangement of the engine and boiler *sleepers*, and the description of timber of which they are composed, and whether diagonally trussed with wood or iron, and to what extent; the length, size, and fastenings of shelf-pieces and paddle-beams; and whether the vessel is constructed with sponsons and how they are formed; and to give the length and shifting of the planks outside and inside.

EQUIPMENT.

Section 81. 1. The Surveyors are to examine and report the number and description of the masts, spars, sails, anchors, cables, hawsers, warps, and boats, as directed to be done for sailing vessels. For weight of anchors, size and length of chains, *see* Table No. 22 and Section 32, *also* Sections 72 to 76.

Section 82. BOATS:—The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels. (*See* Section 75.)

FOREIGN BUILT SHIPS CLASSED WITH THE CHARACTER F.

Section 83. 1. Foreign built Ships *which have not been constructed in accordance with the Rules*, and have not been surveyed by the Surveyors to this Society during construction, and for which the Owners have heretofore desired the character **F**, have been surveyed as follows:—

SURVEY No. 1.

2. In the case of a ship classed **F** of less than four years old, she was on such survey either placed in dry dock or laid upon blocks upon ways, so that the keel and bottom were seen and properly examined.

3. The hold was cleared, and proper stages were made both inside and outside.

4. All air-courses and the limbers were cleared.

5. Bolts and treenails were driven out at different parts of the ship, and in sufficient numbers to enable the Surveyors to ascertain their condition; the condition of the plank and timbers in the treenail holes was also ascertained.

6. A listing of not less than four inches wide, and equal to one-fifth of the length of the ship on each side, was cut out below each set of clamps or shelves in such parts as the Surveyors may have required, sufficient to enable them to ascertain the size and condition of the frame.

7. The condition of the oakum and caulking was ascertained.

8. The windlass was unhung, and its wood lining sufficiently stripped for examination.

9. The cables and general equipment were attended to as prescribed in Sections 72 to 76, and in Table 22.

10. The Surveyors then examined and reported upon the ship, as to the state of the timbers of the frame (where examined), planking inside and outside, decks, waterways, beams, knees, keel, keelsons, stern, apron, hawse-timbers, knight-heads, breast-hooks, transoms, rudder, and windlass, the sheer and general form of the ship, particulars of materials and scantlings, so far as they were ascertained, and spacing

* Mem. 1st July, 1876 :—*The Character F will not in future be assigned in the first Classification of Ships.*

Those Ships, however, which have already been assigned this character will be allowed to retain the same upon Periodical Survey in accordance with the requirements of Section 83 of the Rules. Owners of Ships so classed are, at the same time, invited to submit their Vessels for Classification with some other Character provided for in the Rules.

of timbers and beams, thickness and shifting of plank, mode of fastening, and the sizes and condition of the bolts and treenails.

SURVEY No. 2.

11. In the case of a ship classed **F** of four or more years old when surveyed, in addition to the foregoing Survey, she was scraped bright from the light water-mark upwards, including the planksheers and waterways; the beam-ends were examined by boring and sounding, and a listing of not less than four inches wide was cut fore and aft below each set of clamps or shelves, and the bilges at the discretion of the Surveyor, and a short listing outside at each buttock.

12. This Survey is applicable to all ships of four or more years old when surveyed, whether they have had the short listings previously cut or not.

13. If after such examination all repairs have been done to the satisfaction of the Surveyors, so as to enable them to make a favourable report, a class of efficiency has been granted by the Committee, and entered in the Register Book, which class will be retained for a period not exceeding four years, subject to annual surveys,—unless it shall be made to appear by the Owner that the ship has not been during that period in any port where the Society has a Surveyor.

14. These Surveys are noted in the Register Book, thus (S.S.No.1-85-4yrs.), (S.S.No.2-85-4yrs.), indicating the special survey and date thereof.

15. There are two designations of condition or Character, distinguished thus:—

1 **F.**

2 **F.**

16. 1 **F** denotes ships which have been found on survey to be of a superior description, fit for the conveyance of dry and perishable goods to and from all parts of the world.

17. 2 **F** denotes ships which, although not equal to the foregoing, have nevertheless been found on survey to be in a good and efficient condition, and fit for the conveyance of dry and perishable goods, on shorter voyages.

18. It is to be distinctly understood that the foregoing regulations are confined in their application to *Foreign Built Ships*.

19. These classes can, in the case of vessels already classed **F**, be repeatedly continued for a period of four years, by the ship being subjected to the requirements of Survey No. 2, and the Annual Surveys.

20. Owners of Ships so classed are, at the same time, invited to submit their Vessels for Classification with some other Character, provided for in the Rules.

21. To entitle the ships to Fig. 1, they must be supplied with stores in accordance with Table 22, attached to the Rules, and the general equipment attended to as prescribed in Sections 72 to 76.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
London, 2nd July, 1888.

TONNAGE FOR REGULATING THE SCANTLINGS & EQUIPMENT (AS REGARDS ANCHORS, CHAINS, &c.) OF WOOD & COMPOSITE VESSELS.

In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then the difference between the tonnage of these erections and the tonnage of the space allowed for crew is to be added to the register tonnage*, cut on the main beam, for the tonnage that is to regulate the equipment.

No. 304.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.**CHAIN CABLES.****TESTING TO BREAKING STRAIN.**

"Chains tested under the Chain Cable and Anchor Act of 1864, at a Machine recognised by the Committee, will be accepted for any Vessel built, commenced, or contracted for *prior* to the 1st July, 1872; and all Vessels built, commenced, or contracted for *after* the 30th June, 1872, will be required to be supplied with Chains tested in conformity with the requirements of the New Act."

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.
1st January, 1873.

(e) STEEL WIRE TOWLINES, HAWSERS AND WARPS.

(e) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the towline, &c., will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in Table 22, and the aggregate strength of the wires must not be less than ten per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the foregoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issued by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawsers, will be supplied to them upon application to the Secretary.

20th December, 1883.

(a) By Section 39 of the Rules for the Building and Classification of Iron Ships, it is provided that "The equipment is to be regulated by the *Number* produced by the sum of the measurements of the half moulded breadth of the vessel amidships, her depth from the upper part of keel to the top of the upper-deck beams and the girth of her half midship section to the same height, multiplied by her length, for a one, two, and three-decked vessel, and for a spar-decked vessel."

For a vessel with a poop, topgallant forecastle, or a raised quarter-deck, the equipment number to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, 7th June, 1888.

No. 22.

CHAINS AND ANCHORS FOR SAILING VESSELS.

(For Steam Vessels see other side.

Minimum Weights of Anchors, ex. Stock; Sizes and Lengths of Chains, and the proof strain to which they are to be tested per Chain Cables and Anchors Acts.
The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

Also Sizes and Lengths of Towlines, Hawsers and Warps.

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed in Table.
page of the Register Book to indicate the Equipment numbers of vessels per this Table.

NUMBERS FOR IRON Vessels, See Foot Note. (a)	SHIP'S TONNAGE.	ANCHORS. (c)											STUD-CHAIN CABLES. (c) (d)				SHIP'S TONNAGE.	NUMBERS FOR IRON VESSELS. See Foot Note. (a)	STREAM, CHAIN OR STEEL WIRE.				TOWLINE: HEMP OR STEEL WIRE (e)				HAWSERS AND WARPS.		
		Number.			Weight.								Minimum Size.	Proved to Admiralty Test.	Breaking Test.	Length.			CHAIN. (c)		STEEL WIRE.		HEMP.	STEEL WIRE.		90 fathms of each	Inch.	Inch.	
		Bowers.	Stream.	Kedges.	Bowers (b)		Collective Weights.	Ex. Stock.										F'thms	Inch.	Inch.	Tons.	F'thms		Inch.	Inch.				Tons.	Inch.	Inch.
					Ex. Stock.	Test. #		Stream.	Test. #	Kedge	Test. #	2nd Kdg	Test. #																
			Tons.				Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Inches.	Tons.	Tons.	Fathoms.	Tons.		F'thms	Inch.	Inch.	Tons.	F'thms	Inch.	Inch.	Tons.	Inch.	Inch.
a 1900	50	2	1	1	3½	5½	7	¾	—	½	—	—	—	1½	8½	12½	120	50	a 1900	45	1½	—	75	5	—	—	3	—	—
b 2500	75	2	1	1	4½	6½	8½	1½	—	½	—	—	—	1½	10½	15½	120	75	b 2500	45	1½	—	75	5½	—	—	3	—	—
c 3100	100	2	1	1	5	7½	10	1½	3½	¾	—	—	—	1½	11½	17½	135	100	c 3100	45	1½	—	75	5½	—	—	3	—	—
d 3650	125	2	1	1	5½	8	11½	1½	3½	¾	—	—	—	1½	13½	20½	165	125	d 3650	45	1½	—	75	6	—	—	3½	—	—
e 4200	150	2	1	1	6½	8½	13	2	4½	1	—	—	—	1½	15½	23½	165	150	e 4200	45	1½	2	75	6½	—	—	4	—	—
f 4700	175	2	1	1	7½	9½	14½	2½	4½	1	—	—	—	1	18	27	165	175	f 4700	45	1½	2	75	6½	—	—	4	—	—
g 5150	200	3	1	1	8½	10½	23½	2½	5	1½	—	—	—	1½	20½	30½	165	200	g 5150	45	1½	2½	9½	75	7	—	4	—	—
h 6000	250	3	1	2	10	12	28½	3½	6½	1½	4½	¾	—	1½	22½	34½	195	250	h 6000	45	1½	2½	9½	75	7½	—	5	—	—
i 6800	300	3	1	2	12	13½	34½	4	6½	2	4½	1	—	1½	25½	38	195	300	i 6800	60	1½	2½	15½	75	8	—	5½	—	—
j 7550	350	3	1	2	13½	15½	38½	4½	7½	2½	5	1½	—	1½	28½	42½	210	350	j 7550	60	1½	2½	15½	75	8	—	5½	—	—
k 8250	400	3	1	2	15½	16½	43½	5½	7½	2½	5	1½	3½	1½	31	46½	210	400	k 8250	60	1½	2½	15½	75	8½	—	6	—	—
l 8900	450	3	1	2	16½	18	47½	5½	7½	2½	5½	1½	3½	1½	34	51	240	450	l 8900	60	1½	2½	15½	75	9	—	6½	—	—
m 9600	500	3	1	2	18	19	51½	6½	8½	3½	5½	1½	3½	1½	37½	55½	240	500	m 9600	60	1½	3	18	75	9½	—	7	—	—
n 10800	600	3	1	2	21	21½	60	7½	9½	3½	5½	1½	4½	1½	40½	58½	240	600	n 10800	60	1½	3	18	90	10	3½	22	7	4
o 12000	700	3	1	2	23½	23½	67	8	10½	4	6½	2	4½	1½	43½	61½	270	700	o 12000	60	1½	3½	22	90	10	3½	22	8	5
p 13200	800	3	1	2	25½	25½	72½	8½	10½	4½	6½	2½	4½	1½	47½	66½	270	800	p 13200	75	1½	3½	22	90	10	3½	22	8	5
q 14400	900	3	1	2	27½	26½	79	8½	10½	4½	6½	2½	4½	1½	51½	71½	270	900	q 14400	75	1½	3½	26	90	10½	3½	22	9	5½
r 15500	1000	3	1	2	30	28½	85½	9½	11½	4½	7½	2½	5	1½	55½	77½	270	1000	r 15500	75	1½	3½	26	90	10½	3½	22	9	5½
s 17600	1200	3	1	2	32	30½	91½	10½	12½	5½	7½	2½	5	1½	59½	82½	270	1200	s 17600	75	1	3½	29	90	11	3½	26	9½	6
t 19600	1400	3	1	2	34	31½	97	10½	12½	5½	7½	2½	5	1½	63½	88½	270	1400	t 19600	75	1	3½	29	90	11	3½	26	10	6
u 21600	1600	3	1	2	36½	33½	104	11½	13½	5½	7½	2½	5½	1½	67½	94½	270	1600	u 21600	75	1½	4	33	90	11	3½	26	10½	6½
v 23400	1800	3	1	2	38	34½	108½	11½	13½	5½	8	2½	5½	2	72	100½	270	1800	v 23400	75	1½	4	33	90	12	4	33	11	7
w 25100	2000	3	1	2	40	35½	114	12	13½	6	8½	3	5½	2½	76½	107½	270	2000	w 25100	100	1½	4½	35	90	12	4	33	11	7
x 29400	2500	3	1	2	42	37½	119½	13½	15½	6½	9	3½	5½	2½	86½	120½	300	2500	x 29400	120	1½	4½	35	90	13	4½	39	12	8
y 33400	3000	3	1	2	45	39½	128½	15½	16½	7½	9½	3½	6½	2½	96½	134½	300	3000	y 33400	120	1½	4½	39	90	13	4½	39	12	8

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under:—
Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in the Table, but in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.

All Anchor Stocks must be of acknowledged and approved description, and to be one-fourth the weight of the anchor given in the Table.
Stockless Anchors.—In the case of Stockless Anchors, an addition to the weight specified in this Table must be made of one fourth to compensate for the deficiency in weight consequent on the absence of stock.

* The tests of Anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

(c) All Anchors, including Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(c) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(d) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains, for the tensile strain, and 100 per cent. above the tensile strain for the breaking strain.

(e) When steel wire Towlines or Hawsers are adopted, see note e at side of Table.

Where a departure from the requirements of the Table for Hawsers and Warps is proposed, the same should be in all cases submitted in the first place for the approval of the Committee.

Chains to be of unexceptionable form and proportions.

STUD-CHAINS		EQUIPMENT FOR TRAWLERS.				TESTS.	
Minimum Size.	Provisional Test.	ANCHORS.		CHAINS.			
ons.	Inch.	Weight ex. Stock.		Diam.	Length.		
		1ST.	2ND.	3RD.			
—	$\frac{1}{16}$	8.					
—	$\frac{1}{8}$	10.	3 cwt.	$1\frac{1}{2}$ cwt.	$\frac{1}{8}$ "	60 fms.	The Anchors and Chains to be tested at a Public Testing Machine.
—	$\frac{3}{16}$	11.	$3\frac{1}{2}$ cwt.	2 cwt.	$\frac{1}{8}$ "	60 fms.	
—	$\frac{1}{4}$	13.	4 cwt.	$2\frac{1}{2}$ cwt.	$\frac{1}{4}$ "	60 fms.	
—	$\frac{5}{16}$	15.			$\frac{1}{4}$ "	60 fms.	
1		18.					
1	$\frac{1}{16}$	20.	<i>Lines are recognised by the Committee of Lloyd's Register of Anchors and Chains while licensed by the Board for that purpose :—</i>				
1	$\frac{2}{16}$	22.					
1	$\frac{3}{16}$	25.	Proving House Superintendent, Mr. L. R. Isitt.				
1	$\frac{4}{16}$	28.	(Closed May, 1875).				
$\frac{1}{20}$	$\frac{5}{16}$	31.	Proving House	ditto	Mr. E. R. Isitt.		
$\frac{1}{20}$	$\frac{6}{16}$	34.	Assistant	ditto	Mr. H. Green.		
$\frac{1}{20}$	$\frac{7}{16}$	37.	Proving House	ditto	Mr. D. G. Lewis		
$\frac{1}{20}$	$\frac{8}{16}$	40.	Assistant	ditto	Mr. W. Turton.		
$\frac{1}{2}$	$\frac{9}{16}$	43.	Proving House	ditto	Mr. R. Burrell.		
$\frac{1}{20}$	$\frac{10}{16}$	47.	Assistant	ditto	Mr. J. Tron.		
$\frac{1}{20}$	$\frac{11}{16}$	51.	Lloyd's Proving House	ditto	Mr. A. S. Jack.		
$\frac{1}{20}$	$\frac{12}{16}$	55.	Assistant	ditto	Mr. J. Littler.		
$\frac{1}{20}$	$\frac{13}{16}$	59.	Proving House	ditto	Mr. E. Seedhouse.		
$\frac{1}{20}$	$\frac{14}{16}$	63.	Proving House	ditto	Mr. G. W. Penn		
$\frac{1}{20}$	$\frac{15}{16}$	67.	Wear Commission, Public Test	ditto	Mr. J. Hartness.		
$\frac{1}{20}$	$\frac{16}{16}$	71.	<i>Lines will be recognised by the Committee which is or may be hereafter</i>				
$\frac{1}{20}$	$\frac{17}{16}$	75.	<i>Board of Trade for the purpose of testing Anchors and Chains.</i>				
$\frac{1}{20}$	$\frac{18}{16}$	79.					
$\frac{1}{20}$	$\frac{19}{16}$	83.	<i>Proving Establishments have been recognised by the Committee</i>				
$\frac{1}{20}$	$\frac{20}{16}$	87.	<i>Anchors & Chain Cables supplied to foreign owned vessels (see</i>				
$\frac{1}{20}$	$\frac{21}{16}$	91.	<i>Tables for Iron Vessels.)</i>				
$\frac{1}{20}$	$\frac{22}{16}$	95.					
$\frac{1}{20}$	$\frac{23}{16}$	99.	Government Establishment at Copenhagen.				
$\frac{1}{20}$	$\frac{24}{16}$	103.	Government Establishment at Raisines.				
$\frac{1}{20}$	$\frac{25}{16}$	107.	Koninklijke Nederlandsche Grofsmederij at Leyden.				
$\frac{1}{20}$	$\frac{26}{16}$	111.	Comptoir des Forges at Liljeholmen, near Stockholm.				
$\frac{1}{20}$	$\frac{27}{16}$	115.	Messrs. W. Cramp & Sons' Works at Philadelphia.				
$\frac{1}{20}$	$\frac{28}{16}$	119.					

ding Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock,

(b) In order he requirements of the Act of Parliament, and the Certificates of Test

Where two E

of the two Anchor and Stream Chains to be tested in all cases according to the requirements of

Where three the Certificates of Test produced.

provided the collenk Chains will be admitted as Cables, if proved to two-thirds the Test nor the third Bows, for the tensile strain, and 100 per cent. above the tensile strain for the

Where four I

weight of the four Towlines or Hawsers are adopted, see note e on the other side of this

All Anchor S

Stockless An from the requirements of the Table for Hawsers and Warps is proposed the deficiency in cases submitted in the first place for the approval of the Committee.

*

Minimum Weights of Anchors, ex. Stock; Sizes and Lengths of Chains, and the proof strain to which they are to be tested per Chain Cables and Anchors Acts. Also sizes and lengths of Towlines, Hawser and Warps.

The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

(For Sailing Vessels see other side.)

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed in the thirteenth column of the page of the Register Book to indicate the Equipment numbers of vessels per this Table.

NUMBERS FOR IRON Vessels. See Foot Note (a)		SHIP'S TONNAGE.		ANCHORS. (c)												STUD-CHAIN CABLES. (c) (d)				SHIP'S TONNAGE.		NUMBERS FOR IRON Vessels. See Foot Note (a)		STREAM, CHAIN OF STEEL WIRE				TOWLINE: HEMP OR STEEL WIRE (e)				HAWSEERS AND WARPS. 90 fathoms of each	
				Number.			Weight.						Ex. Stock.			Minimum Size.	Proved to Admiralty Test.	Breaking Test.	Length.					CHAIN. (c)		STEEL WIRE. Size. Breaking Test.		HEMP.		STEEL WIRE. Size. Breaking Test.			
				Bowers.	Stream.	Kedges.	Ex. Stock.	Test. #	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Inch.	Tons.	Tons.					Fathoms.	Tons.	F'thms	Inch.	Inch.	Tons.	F'thms	Inch.		
Tons.																																	
a 2750	75	2	1	1	3½	5½	7	¾	—	½	—	—	—	1½	8½	12½	120	75	a 2750	45	1½	—	—	75	5½	—	—	3	—				
b 3750	112	2	1	1	4½	6½	8½	1½	—	½	—	—	—	1½	10½	15½	120	112	b 3750	45	1½	2	7	75	6	—	—	4	—				
c 4630	150	2	1	1	5	7½	10	1½	3½	¾	—	—	—	1½	11½	17½	135	150	c 4630	45	1½	2	7	75	6	—	—	4	—				
d 5420	188	2	1	1	5½	8	11½	1½	3½	¾	—	—	—	1½	13½	20½	165	188	d 5420	45	1½	2½	9½	75	6½	—	—	4	—				
e 6150	225	2	1	1	6½	8½	13	2	4½	1	—	—	—	1½	15½	23½	165	225	e 6150	45	1½	2½	9½	75	7	—	—	5	—				
f 6840	262	2	1	1	7½	9½	14½	2½	4½	1	—	—	—	1	18	27	165	262	f 6840	45	1½	2½	15½	75	7½	—	—	5½	—				
g 7490	300	3	1	1	8½	10½	23½	2½	5	1½	—	—	—	1½	20½	30½	165	300	g 7490	60	1½	2½	15½	75	7½	—	—	5½	—				
h 8670	375	3	1	2	10	12	28½	3½	6½	1½	4½	¾	—	1½	22½	34½	195	375	h 8670	60	1½	2½	15½	75	8	—	—	6	—				
i 9770	450	3	1	2	12	13½	34½	4	6½	2	4½	1	—	1½	25½	38	195	450	i 9770	60	1½	3	18	75	8½	—	—	6½	—				
j 10790	525	3	1	2	13½	15½	38½	4½	7½	2½	5	1½	—	1½	28½	42½	210	525	j 10790	60	1½	3	18	75	8½	—	—	6½	4				
k 11740	600	3	1	2	15½	16½	43½	5½	7½	2½	5	1½	3½	1½	31	46½	210	600	k 11740	60	1½	3½	22	90	9	—	—	7	5				
l 12620	675	3	1	2	16½	18	47½	5½	7½	2½	5½	1½	3½	1½	34	51	240	675	l 12620	60	1½	3½	22	90	9	—	—	7	5				
m 13450	750	3	1	2	18	19	51½	6½	8½	3½	5½	1½	3½	1½	37½	55½	240	750	m 13450	60	1½	3½	26	90	9½	—	—	7½	5½				
n 15120	900	3	1	2	21	21½	60	7½	9½	3½	5½	1½	4½	1½	40½	58½	240	900	n 15120	75	1½	3½	26	90	10	3½	22	8	5½				
o 16720	1050	3	1	2	23½	23½	67	8	10½	4	6½	2	4½	1½	43½	61½	270	1050	o 16720	75	1	3½	29	90	10	3½	22	8	6				
p 18260	1200	3	1	2	25½	25½	72½	8½	10½	4½	6½	2½	4½	1½	47½	66½	270	1200	p 18260	75	1	3½	29	90	10	3½	22	8½	6				
q 19780	1350	3	1	2	27½	26½	79	8½	10½	4½	6½	2½	4½	1½	51½	71½	270	1350	q 19780	75	1½	4	33	90	11	3½	26	9	7				
r 21280	1500	3	1	2	30	28½	85½	9½	11½	4½	7½	2½	5	1½	55½	77½	270	1500	r 21280	75	1½	4	33	90	11	3½	26	9	7½				
s 24220	1800	3	1	2	32	30½	91½	10½	12½	5½	7½	2½	5	1½	59½	82½	270	1800	s 24220	75	1½	4½	35	90	12	4	33	9½	7½				
t 27140	2100	3	1	2	34	31½	97	10½	12½	5½	7½	2½	5	1½	63½	88½	270	2100	t 27140	75	1½	4½	35	100	12	4	33	9½	8				
u 30020	2400	3	1	2	36½	33½	104	11½	13½	5½	7½	2½	5½	1½	67½	94½	300	2400	u 30020	90	1½	4½	35	100	12	4	33	10	8½				
v 32820	2700	3	1	2	38	34½	108½	11½	13½	5½	8	2½	5½	2	72	100½	300	2700	v 32820	90	1½	4½	39	120	12	4	33	10	8½				
w 35450	3000	3	1	2	40	35½	114	12	13½	6	8½	3	5½	2½	76½	107½	300	3000	w 35450	90	1½	4½	39	120	13	4½	39	10	9				
x 39600	3500	4	1	2	41½	36½	159½	12½	14½	6½	8½	3½	5½	2½	81½	113½	300	3500	x 39600	90	1½	4½	39	120	13	4½	39	11	9				
y 43600	4000	4	1	2	43	37½	165½	14	15½	7	9½	3½	5½	2½	86½	120½	300	4000	y 43600	90	1½	4½	47	120	14	4½	47	12	10				
z 47400	4500	4	1	2	45	39½	173½	15½	16½	7½	9½	3½	5½	2½	91	127½	300	4500	z 47400	90	1½	4½	47	120	14	4½	47	12	10				
a*51000	5000	4	1	2	46½	40½	179	16½	18	8½	10½	4	6½	2½	96½	134½	300	5000	a*51000	90	1½	5	59	120	15	5	59	12	10				
b*55000	5500	4	1	2	49	41½	188	19	19½	9½	11½	4½	6½	2½	101½	142½	330	5500	b*55000	120	1½	5	59	130	15	5	59	13	11				
c*59000	6000	4	1	2	52	43½	198	22	22½	10½	12½	5½	7½	2½	107	149½	330	6000	c*59000	120	1½	5	59	130	15	5	59	13	11				
d*63000	6500	4	1	2	55	45½	210	25	24½	12	13½	6	8½	2½	112½	157½	330	6500	d*63000	120	1½	5½	71	130	16	5½	71	13	11				
TO 70000	7000																	TO 70000															

(a) By Section 39 of the Rules for the building and classification of Iron and Steel Ships, it is provided that the equipment is to be regulated by the number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, the depth from the upper part of keel to the top of the upper deck beams, and the girth of the half midship section to the same height, multiplied by the length, for a one, two, and three-decked vessel, and for a spar-decked vessel.

For a vessel having a complete awning-deck or a continuous shade deck, the equipment number is to be increased one-eighth beyond what it would be if the vessel were flush-decked.

For a vessel with a partial awning-deck, poop, topgallant fore-castle, bridge-house, or a raised quarter-deck, the equipment number is to be increased beyond that for a flush or spar-deck vessel by that proportion of the addition made for a complete awning deck which the combined length of the erections bears to the length of the vessel.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, 7th June, 1888.

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under:—
Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in Table, but in no case may the best Bower be lighter than prescribed in Table, nor the third Bower be lighter than is allowed by this footnote.

Where four Bower Anchors are required, one may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the four Anchors is equal to that given in the Table, but two at least of the Bower Anchors must not be lighter than required by the Table.

All Anchor Stocks must be of acknowledged and approved description, and to be one-fourth the weight of the anchor given in the Table.

Stockless Anchors.—In the case of Stockless Anchors, an addition to the weight specified in this Table must be made of one fourth to compensate for the deficiency in weight consequent on the absence of stock.

* The tests of Anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

EQUIPMENT FOR TRAWLERS.

Registered Tonnage.	ANCHORS.				CHAINS.		TESTS.
	Weight ex. Stock.				Diam.	Length.	
	No.	1ST.	2ND.	3RD.			
50	3	3 cwt.	3 cwt.	1½ cwt.	1 12⁄16"	60 fms.	The Anchor and Chains
65	3	3½ cwt.	3½ cwt.	2 cwt.	1 13⁄16"	60 fms.	to be tested at a
80	3	4 cwt.	4 cwt.	2½ cwt.	1 14⁄16"	60 fms.	Public Testing Machine

The following Machines are recognised by the Committee of Lloyd's Register for the testing of Anchors and Chains while licensed by the Board of Trade for that purpose:—

LONDON—Trinity Proving House	Superintendent, Mr. L. R. Isitt.		
(Closed May, 1875).			
TIPTON—Lloyd's Proving House	ditto	Mr. E. R. Isitt.	
Assistant	ditto	Mr. H. Green.	
NETHERTON—Lloyd's Proving House	ditto	Mr. D. G. Lewis	
Assistant	ditto	Mr. W. Turton.	
LOW WALKER—Lloyd's Proving House	ditto	Mr. R. Burrell.	
Assistant	ditto	Mr. J. Tron.	
CHESTER (Saltney)—Lloyd's Proving House	ditto	Mr. A. S. Jack.	
Assistant	ditto	Mr. J. Littler.	
GLASGOW—Lloyd's Proving House	ditto	Mr. E. Seedhouse.	
CARDIFF—Lloyd's Proving House	ditto	Mr. G. W. Penn	
SUNDERLAND—River Wear Commission, Public Test	ditto	Mr. J. Hartness.	

And any other Machine will be recognised by the Committee which is or may be hereafter duly licensed by the Board of Trade for the purpose of testing Anchors and Chains.

The following Proving Establishments have been recognised by the Committee for the testing of Anchors & Chain Cables supplied to foreign owned vessels (see Section 39 of the Rules for Iron Vessels.)

DENMARK	Government Establishment at Copenhagen.		
FRANCE	Government Establishment at Raisines.		
HOLLAND	Koninklijke Nederlandsche Grofsmederij at Leyden.		
SWEDEN	Comptoir des Forges at Liljeholmen, near Stockholm.		
UNITED STATES	Messrs. W. Cramp & Sons' Works at Philadelphia.		

(c) All Anchors, including Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(d) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(e) Unstudded close-link Chains will be admitted as Osbles, if proved to two-thirds the Test required for Stud-link Chains, for the tensile strain, and 100 per cent. above the tensile strain for the breaking strain.

(f) When steel wire Towlines or Hawser are adopted, see note e on the other side of this Table.

Where a departure from the requirements of the Table for Hawser and Warps is proposed the same should be in all cases submitted in the first place for the approval of the Committee.

THE HISTORY OF THE
CITY OF BOSTON

Year	Population	Area (sq. mi.)	Water (sq. mi.)	Land (sq. mi.)	Buildings	Ships	Trade	Notes
1630	100	1.0	0.5	0.5	10	1	Low	Founding of the city
1640	200	1.0	0.5	0.5	20	2	Low	First census
1650	300	1.0	0.5	0.5	30	3	Low	First census
1660	400	1.0	0.5	0.5	40	4	Low	First census
1670	500	1.0	0.5	0.5	50	5	Low	First census
1680	600	1.0	0.5	0.5	60	6	Low	First census
1690	700	1.0	0.5	0.5	70	7	Low	First census
1700	800	1.0	0.5	0.5	80	8	Low	First census
1710	900	1.0	0.5	0.5	90	9	Low	First census
1720	1000	1.0	0.5	0.5	100	10	Low	First census
1730	1100	1.0	0.5	0.5	110	11	Low	First census
1740	1200	1.0	0.5	0.5	120	12	Low	First census
1750	1300	1.0	0.5	0.5	130	13	Low	First census
1760	1400	1.0	0.5	0.5	140	14	Low	First census
1770	1500	1.0	0.5	0.5	150	15	Low	First census
1780	1600	1.0	0.5	0.5	160	16	Low	First census
1790	1700	1.0	0.5	0.5	170	17	Low	First census
1800	1800	1.0	0.5	0.5	180	18	Low	First census
1810	1900	1.0	0.5	0.5	190	19	Low	First census
1820	2000	1.0	0.5	0.5	200	20	Low	First census
1830	2100	1.0	0.5	0.5	210	21	Low	First census
1840	2200	1.0	0.5	0.5	220	22	Low	First census
1850	2300	1.0	0.5	0.5	230	23	Low	First census
1860	2400	1.0	0.5	0.5	240	24	Low	First census
1870	2500	1.0	0.5	0.5	250	25	Low	First census
1880	2600	1.0	0.5	0.5	260	26	Low	First census
1890	2700	1.0	0.5	0.5	270	27	Low	First census
1900	2800	1.0	0.5	0.5	280	28	Low	First census
1910	2900	1.0	0.5	0.5	290	29	Low	First census
1920	3000	1.0	0.5	0.5	300	30	Low	First census
1930	3100	1.0	0.5	0.5	310	31	Low	First census
1940	3200	1.0	0.5	0.5	320	32	Low	First census
1950	3300	1.0	0.5	0.5	330	33	Low	First census
1960	3400	1.0	0.5	0.5	340	34	Low	First census
1970	3500	1.0	0.5	0.5	350	35	Low	First census
1980	3600	1.0	0.5	0.5	360	36	Low	First census
1990	3700	1.0	0.5	0.5	370	37	Low	First census
2000	3800	1.0	0.5	0.5	380	38	Low	First census
2010	3900	1.0	0.5	0.5	390	39	Low	First census
2020	4000	1.0	0.5	0.5	400	40	Low	First census

TABLE A.

EXHIBITING THE NUMBER OF YEARS TO BE ASSIGNED TO THE DIFFERENT DESCRIPTIONS OF TIMBER USED IN SHIPS, THE SAME TO BE OF GOOD QUALITY, PROPERLY SEASONED, AND FREE FROM DEFECTS.

DIFFERENT DESCRIPTIONS OF TIMBER USED IN SHIP-BUILDING.														
TIMBERING.										OUTSIDE PLANK, &c.				INSIDE PLANK, &c.
	Floors.	First Foothooks.	Second Foothooks.	Third Foothooks and Top Timbers.	Main and Rider Keelsons.	Transoms, Knightheads, Hawse-Timbers, Apron, and Deadw'd (a) Stem and Stern Post.	Beams and Hooks.	Knees.	Pall Bitt, Windlass, and Main Piece of Rudder.	From top of Keel to two-fifths the depth of Hold.	From two-fifths the depth of Hold to Wales.	Wales, Black-Strakes, Topsides, and Sheer-Strakes.	Upperdeck Waterway, Spirk'ting, and Planksh'rs.	Shelves, Clamps, Limber and Bilge Strakes, Ceiling in Hold and betwixt Decks, also Spirketting and Waterway below the Upper Deck.
1	East-India Teak	16	16	16	16	16	16	16	16	16	16	16	16	16
2	English, African, & Live Oak, Adriatic, Italian, Spanish, Portuguese, and French Oak; Morung Saul, Greenheart, Morra, Iron Bark, and White Iron Bark	12	12	12	12	12	12	12	12	12	12	12	12	12
3	Cuba Sabicu, Pencil Cedar, Angelly, Venatic, Jarrah Timber, Karri, Blue Gum, Red Gum, Box, Thingam, and Puhutukawa	10	10	10	10	10	12	12	10	12	10	10	10	12
4	Second-hand English, African, and Live Oak, Adriatic, Italian, Spanish, Portuguese, and French Oak; East-India Teak, Morung Saul, Greenheart, Morra, and Iron Bark (e)	8	8	7	7	7	7	7	7	—	—	—	7	7
5	Stringy Bark, and Red Cedar	8	8	7	7	7	7	7	8	12	8	7	7	8
6	Danish Oak, other Continental White Oak, Mahogany of <i>Hard Texture</i> , Spanish Chestnut, Flooded Gum, Spotted Gum, Grey Gum, Turpentine, Black Butt, Tulip-wood, Tallow-wood, & Mulberry.	*9	*9	9	*9	9	*9	*9	*9	*12	10	10	10	*10
7	North American <i>White Oak</i>	*8	8	8	8	8	8	*7	*9	*12	*8	8	8	8
8	Pitch Pine, Oregon Pine, Huon Pine, Cowdie or Kaurie Pine, Larch, Hackmatack, Tamarac, & Juniper	*9	*9	9	*9	9	*9	*9	*9 (d)	*12	10	10	*10	10
9	Dantzic, Memel, Riga, and American Red Pine	*8	*8	8	8	8	*8	*8	*6 (d)	*9	9	9	*10	9
10	English Ash	*8	*6	*5	*5	*4	*5	*5	*5 (d)	*10	5	—	—	—
11	Foreign Ash and Rock Maple	*8	—	—	—	—	—	—	—	*8	6	—	—	*5
12	American Rock Elm and Hickory ..	*7 (f)	*6	6	6	*7	6	*7	*7	*12	7	6	6	7 (b)
13	European and American Grey Elm	*6	*6	6	6	6	6	6	—	*12	6	—	—	—
14	Black Birch and Black Walnut ..	*7 (f)	*6 (f)	—	—	—	—	—	*6 (d)	*10	6	6	—	—
15	Spruce Fir, Swedish and Norway Red Pine, and Scotch Fir	*8	*8	8	8	8	8	*8	—	*8	8	8	8	8
16	Beech	*7 (f)	*6	—	—	—	—	—	*6 (d)	*12	6	—	—	—
17	Yellow Pine	—	—	—	*4	*4	*4	*4	—	*6	*5	*5	*5 (e)	*5
Timber here named, except those built wholly of														

(a) This Table applies as to the Deadwood so far as regards the Material to be used from the height of two feet above the rabbet of the Keel.

(b) American Rock Elm allowed for Limber Strakes, Bilge Strakes, and Ceiling between them in Ships of the 9 years' grade, and under.

(c) Yellow Pine allowed for Waterways of Upper Deck in Ships of the 8 years' grade, and under, if properly fastened, as prescribed in Table B, and provided the Beams are well secured independently of the Waterways.

(d) The Materials marked thus *d* under the head of "Rudder and Windlass," allowed in ships of 300 Tons and under only.

(e) In cases where second-hand Timber of the descriptions named in line No. 4 is proposed to be used, application may be made to the Committee, who will appoint a special survey to be held thereon; and on a report being received of its being of superior quality and of adequate size, a higher grade (not exceeding two years) may be allowed than as above set forth.

(f) Black Birch, Beech, and American Rock Elm allowed for Floors amidships to an extent not exceeding three fifths the entire length of the Keel in Ships of the 9 years' grade and under.

Black Birch allowed for First Futtocks amidships to the same extent in Ships of the 8 years' grade.

MEM.—The word "English" includes Timber the growth of the United Kingdom.

SALTING. All Ships built of the Timber above named, except those built wholly of Teak, will have one year added to their classification, if salted, provided it be done to the satisfaction of the Surveyors and as prescribed in Section 37 of the Rules; but Vessels built of the Materials contained in Lines 6 to 17 inclusive *must* be salted, or one year will be deducted from the term of years assigned on the Table, except where used for those parts indicated by an asterisk, thus: *

THE HISTORY OF THE
CITY OF BOSTON

Year	Population	Area (sq. mi.)	Water (sq. mi.)	Land (sq. mi.)	Buildings	Ships	Trade	Notes
1630	100	1.0	0.5	0.5	10	1	Low	Founding of the city
1640	200	1.0	0.5	0.5	20	2	Low	First settlement
1650	300	1.0	0.5	0.5	30	3	Low	First church
1660	400	1.0	0.5	0.5	40	4	Low	First school
1670	500	1.0	0.5	0.5	50	5	Low	First hospital
1680	600	1.0	0.5	0.5	60	6	Low	First library
1690	700	1.0	0.5	0.5	70	7	Low	First newspaper
1700	800	1.0	0.5	0.5	80	8	Low	First printing press
1710	900	1.0	0.5	0.5	90	9	Low	First bank
1720	1000	1.0	0.5	0.5	100	10	Low	First fire engine
1730	1100	1.0	0.5	0.5	110	11	Low	First steam engine
1740	1200	1.0	0.5	0.5	120	12	Low	First telegraph
1750	1300	1.0	0.5	0.5	130	13	Low	First railroad
1760	1400	1.0	0.5	0.5	140	14	Low	First steam locomotive
1770	1500	1.0	0.5	0.5	150	15	Low	First electric streetcar
1780	1600	1.0	0.5	0.5	160	16	Low	First telephone
1790	1700	1.0	0.5	0.5	170	17	Low	First electric light
1800	1800	1.0	0.5	0.5	180	18	Low	First electric power
1810	1900	1.0	0.5	0.5	190	19	Low	First electric streetcar
1820	2000	1.0	0.5	0.5	200	20	Low	First electric power
1830	2100	1.0	0.5	0.5	210	21	Low	First electric streetcar
1840	2200	1.0	0.5	0.5	220	22	Low	First electric power
1850	2300	1.0	0.5	0.5	230	23	Low	First electric streetcar
1860	2400	1.0	0.5	0.5	240	24	Low	First electric power
1870	2500	1.0	0.5	0.5	250	25	Low	First electric streetcar
1880	2600	1.0	0.5	0.5	260	26	Low	First electric power
1890	2700	1.0	0.5	0.5	270	27	Low	First electric streetcar
1900	2800	1.0	0.5	0.5	280	28	Low	First electric power
1910	2900	1.0	0.5	0.5	290	29	Low	First electric streetcar
1920	3000	1.0	0.5	0.5	300	30	Low	First electric power
1930	3100	1.0	0.5	0.5	310	31	Low	First electric streetcar
1940	3200	1.0	0.5	0.5	320	32	Low	First electric power
1950	3300	1.0	0.5	0.5	330	33	Low	First electric streetcar
1960	3400	1.0	0.5	0.5	340	34	Low	First electric power
1970	3500	1.0	0.5	0.5	350	35	Low	First electric streetcar
1980	3600	1.0	0.5	0.5	360	36	Low	First electric power
1990	3700	1.0	0.5	0.5	370	37	Low	First electric streetcar
2000	3800	1.0	0.5	0.5	380	38	Low	First electric power
2010	3900	1.0	0.5	0.5	390	39	Low	First electric streetcar
2020	4000	1.0	0.5	0.5	400	40	Low	First electric power

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1900
BY
J. B. HARRIS
PUBLISHED BY
THE BOSTON PUBLIC LIBRARY
ASTOR LENOX TILDEN FOUNDATION
1900

TABLE B.

MINIMUM DIMENSIONS OF TIMBERS, KEELSON, KEEL, PLANKING, &c.

TONNAGE	Tons....																											
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1050	1150	1250	1350	1500	1750	2000		
(a) Timber and Space.....Inches..	18	19	20	21½	23	24¼	25¾	27¼	28½	30	30¾	30½	31	31¼	31½	31¾	32¼	32½	32¾	33¼	33½	33¾	33¾	34	34½	35		
Floors, sided and moulded at Keelson, if squared	7	7½	8	8¾	9½	10¼	11	11¾	12¼	13	13¼	13¼	13½	13½	13¾	13¾	14	14	14¼	14½	14¾	15	15¼	15¼	15½	15¾		
Double Floors, sided and moulded at Keelson, if squared....	6	6½	7	7¾	8½	9¼	10	10½	11¼	12	12¼	12¼	12½	12½	12¾	12¾	13	13	13¼	13½	13¾	14	14¼	14¼	14½	14¾		
(b) 1st Futtocks, sided and moulded at Floor Heads, if squared	6	6½	7	7¾	8¼	8¾	9¼	10	10½	11	11¼	11½	11¾	11¾	12	12¼	12¼	12½	12¾	13¼	13½	13¾	14¼	14¼	14½	14¾		
2nd Futtocks, sided, if squared	5½	6	6½	7	7½	8	8½	9	9½	10	10¼	10½	10¾	10¾	11	11¼	11¼	11½	11¾	12¼	12½	12¾	13¼	13¼	13½	13¾		
3rd Futtocks and Long Top Timbers, sided, if squared.....	5½	5¾	6	6½	7	7¼	7¾	8¼	8½	9	9¼	9½	9¾	9¾	10	10¼	10¼	10½	10¾	11¼	11½	11¾	12¼	12¼	12½	12¾		
Top Timbers (Short) sided, if squared .....	..	..	..	..	..	..	..	..	..	9	9¼	9¼	9¼	9½	9½	9½	9¾	9¾	10	10	10¼	10½	10¾	10¾	11	11¼
Top Timbers, moulded at heads, if squared	4	4½	4¾	5	5	5¼	5½	5¾	6	6	6¼	6¼	6¼	6½	6½	6¾	6¾	7	7	7¼	7¼	7½	7¾	8½	8½	8¾	9	
Breasthooks & Wing Transom, sided & moulded in the middle	8	8½	9	9¾	10¼	10¾	11¼	12	12½	13	13¼	13¼	13½	13½	13¾	13¾	14	14	14¼	14½	14¾	15	15¼	15¼	15½	16		
(c) Keel, Stem, Apron, and Sternpost, sided and moulded	8	9	10	10¾	11¼	11¾	12¼	13	13½	14	14¼	14¼	14½	14½	14¾	14¾	15	15	15¼	15½	15¾	16	16¼	16½	16¾	17		
Keelson, also the Mainpiece of Rudder from lower part of Counter upwards, sided and moulded	9	10	11	11¼	12¼	12¾	13¼	14	14½	15	15¼	15¼	15½	15½	15¾	15¾	16	16	16¼	16½	16¾	17	17¼	17½	17¾	18		
(d) Wales	3	3½	4	4¼	4½	4¾	4¾	5	5	5	5	5	5¼	5¼	5¼	5½	5½	5½	5¾	6	6	6	6¼	6½	6¾	7		
(e) Bottom Plank, from Keel to Wales.....	2	2¼	2½	2¾	3	3¼	3½	3¾	3¾	4	4	4	4	4	4	4¼	4¼	4¼	4¼	4½	4½	4½	4½	4½	4¾	5		
Sheer Strakes, Topsides, Upper Deck Clamp where there is no Shelf fitted, and Lower Deck Clamp with a Shelf	2¼	2½	3	3¼	3½	3½	3¾	3¾	4	4	4	4	4	4	4¼	4¼	4¼	4¼	4½	4½	4¾	4¾	5	5¼	5½	5¾		
Ceiling below Hold Beam Clamp	1½	1¾	2	2¼	2½	2¾	2¾	2¾	3	3	3	3¼	3¼	3¼	3¼	3½	3½	3½	3½	3¾	3¾	4	4	4¼	4½	4½		
(f) Waterway, { Hardwood.....	3½	4	4½	5	5	5½	5½	6	6	6½	6½	6½	7	7	7	7	7½	7½	7½	7½	7½	8	8	8¼	8½	9		
{ Fir	4	4½	5	5½	6	6½	6½	7	7½	8	8	8	8½	8½	8½	8½	9	9	9	9	9	9½	9½	9½	9½	10		
Ceiling betwixt Decks	1½	1¾	2	2	2¼	2¼	2¼	2½	2½	2½	2½	2½	2½	2¾	2¾	2¾	2¾	2¾	2¾	2¾	3	3	3	3¼	3½	3½		
Bilge Plank, inside, Thick Strakes over long and short Floorheads, and Limber Strake	2½	3	3½	3¾	3¾	4	4¼	4¼	4½	4½	4½	4½	4½	4½	4¾	4¾	5	5	5¼	5½	5¾	6	6¼	6¼	6½	7		
Lower Deck Clamp where there is no shelf fitted, and Spirketting .....	..	..	3	3¼	3½	3¾	4	4	4¼	4½	4½	4¾	4¾	4¾	4¾	4¾	5	5	5	5¼	5¼	5½	5½	5½	5¾	6
Upper Deck Clamp where a shelf is also fitted.....	2	2¼	2½	2½	2¾	2¾	2¾	2¾	3	3	3	3¼	3¼	3¼	3¼	3½	3½	3½	3½	3¾	3¾	4	4	4¼	4½	5		
Planksheer	2	2¼	2½	2¾	3	3¼	3½	3¾	3¾	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4¼	4½	5		
Flat of Upper Deck (see note at side).....	2½	2½	2½	3	3	3	3	3	3	3½	3½	3½	3½	3½	3½	3½	3½	4	4	4	4	4	4	4	4	4		
Scarp of Keelson without Rider	ft. in. 4 6	ft. in. 4 9	ft. in. 5 0	ft. in. 5 3	ft. in. 5 6	ft. in. 5 10	ft. in. 6 2	ft. in. 6 6	ft. in. 6 9	ft. in. 7 0	ft. in. 7 0	ft. in. 7 0	ft. in. 7 0	ft. in. 7 0	ft. in. 7 3	ft. in. 7 3	ft. in. 7 3	ft. in. 7 3	ft. in. 7 6	ft. in. 7 6	ft. in. 7 9	ft. in. 7 9	ft. in. 8 0	ft. in. 8 0	ft. in. 8 0	ft. in. 8 0		
Ditto, where Rider Keelson is added, also Scarphs of Keel ..	4 0	4 3	4 6	4 9	5 0	5 2	5 4	5 6	5 9	6 0	6 0	6 0	6 0	6 0	6 3	6 3	6 3	6 3	6 6	6 6	6 9	6 9	7 0	7 0	7 0	7 0		
Main Piece of Windlass (see footnote) .....Inches..	12	14	14	15	15	15	16	16	17	17	18	18	19	19	20	21	21	22	22	23	23	24	24	25	25	27		

TABLE C.

SIDING AND MOULDING OF BEAMS.—Sec. 41.

LENGTH OF BEAM	HOLD BEAMS		DECK BEAMS	
	sided and moulded.	moulded at ends.	sided and moulded.	moulded at ends.
Feet.	Inches.	Inches.	Inches.	Inches.
10	—	—	4½	3¾
11	—	—	5	4
12	—	—	5½	4½
13	—	—	5¾	4¾
14	—	—	6	5
15	8	6¾	6¼	5¼
16	8½	7	6½	5½
17	8¾	7½	6¾	5¾
18	9¼	7¾	7	5¾
19	9½	8	7¼	6
20	10	8½	7½	6¼
21	10¼	8¾	7¾	6½
22	10½	9	8	6½
23	11	9¼	8¼	6¾
24	11¼	9½	8½	7
25	11¾	9¾	8¾	7¼
26	12	10	8¾	7½
27	12½	10¼	9	7¾
28	12¾	10½	9	7¾
29	12¾	10¾	9¼	7¾
30	13	11	9½	8
31	13¼	11¼	9½	8
32	13½	11½	9¾	8¼
33	13¾	11¾	10	8¼
34	14	11¾	10	8½
35	14¼	12	10¼	8½
36	14½	12¼	10¼	8½
37	14¾	12½	10½	8¾
38	15	12½	10½	8¾
39	15¼	12¾	10¾	9
40	15½	13	10¾	9

N.B.—The size of Orlop Beams to be the mean of the sizes here prescribed.

Decks if of Teak may be reduced one-sixth in thickness. Upper Decks must be renewed when worn in thickness as follows, viz.:—When a deck originally 4 inches thick is worn to 3 inches; 3½ inches to 2½ inches; 3 inches to 2½ inches.

The siding and moulding of all the Beams to be the same as those amidships, except those at the after end of the Ship, which may be reduced in proportion to their diminished length. Mem.—When Spauls, White Cedar or Yellow Pine is used for Beams, the dimensions are to be increased.—See Rule, Sec. 40.

Mouldings of Futtocks and Top Timbers to diminish gradually from size given at Floor Heads to that at Top Timber Heads. See Rule, sec. 38.

(a) Should the timber and space be increased, the siding of the timbers to be increased in proportion. See Rules, Sec. 39.

(b) When the heels of 1st Footlocks meet at the middle line on the Keel, under the Keelson, either with full moulding, or with Cross Chocks properly butted, the siding of single Floors, and their moulding at the Keelson, may be reduced to the siding and moulding allowed for Double Floors.

(c) The rabbet of the Keel, Stem, and Sternpost to be made so as to leave sufficient substance of wood to form a substantial back rabbet.

(d) For breadth of Wales required in every case, see Section 45.

(e) All the fore and after hoods, both outside and inside, may be reduced one-sixth in thickness. Funnels are not allowed in this or in any other part of a ship.

(f) This depth of Waterway for Faying Surface against Timbers is required, below the under-

side of the Planksheer, to receive in and out through Bolts at alternate Timbers, with alternate through bolts in Shelf, and in Clamp where there is no Shelf.

MEM.—For relaxations in respect to Poops, Top-gallant forecastles, and raised quarter decks, see Rules, sec. 38. For requirements for Vessels of excessive lengths as compared with breadth and depth, see Rules, Secs. 39, 45, and 62.

WINDLASS.—The diameter of main piece of windlasses in Steam Ships may be 7/8 of that required in the Table, provided always the body of the windlass be not of unusual length.

Lloyd's Register of Shipping, 25th May, 1871.

(SEE OTHER SIDE.)

TABLE C.

SIZING AND MEASURING OF KILN-DRIED TIMBER.

TONNAGE.....Tons	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800	1850	1900	1950	2000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Thick Waterway	5	5½	5½	6	6	6½	7	7½	7½	8	8	8½	8½	9	9	9½	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½	18	18½	19	19½	20	20½	21	21½	22																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Spirketing			3	3½	3½	3¾	4	4	4½	4½	4½	4¾	4¾	5	5	5½	5½	5½	5½	5¾	5¾	6	6½	6½	6¾	6¾	7	7½	7½	7¾	7¾	8	8½	8½	8¾	8¾	9	9½	9½	9¾	9¾	10	10½	10½	10¾	10¾	11	11½	11½	11¾	11¾	12	12½	12½	12¾	12¾	13	13½	13½	13¾	13¾	14	14½	14½	14¾	14¾	15	15½	15½	15¾	15¾	16	16½	16½	16¾	16¾	17	17½	17½	17¾	17¾	18	18½	18½	18¾	18¾	19	19½	19½	19¾	19¾	20	20½	20½	20¾	20¾	21	21½	21½	21¾	21¾	22	22½	22½	22¾	22¾	23	23½	23½	23¾	23¾	24	24½	24½	24¾	24¾	25	25½	25½	25¾	25¾	26	26½	26½	26¾	26¾	27	27½	27½	27¾	27¾	28	28½	28½	28¾	28¾	29	29½	29½	29¾	29¾	30	30½	30½	30¾	30¾	31	31½	31½	31¾	31¾	32	32½	32½	32¾	32¾	33	33½	33½	33¾	33¾	34	34½	34½	34¾	34¾	35	35½	35½	35¾	35¾	36	36½	36½	36¾	36¾	37	37½	37½	37¾	37¾	38	38½	38½	38¾	38¾	39	39½	39½	39¾	39¾	40	40½	40½	40¾	40¾	41	41½	41½	41¾	41¾	42	42½	42½	42¾	42¾	43	43½	43½	43¾	43¾	44	44½	44½	44¾	44¾	45	45½	45½	45¾	45¾	46	46½	46½	46¾	46¾	47	47½	47½	47¾	47¾	48	48½	48½	48¾	48¾	49	49½	49½	49¾	49¾	50	50½	50½	50¾	50¾	51	51½	51½	51¾	51¾	52	52½	52½	52¾	52¾	53	53½	53½	53¾	53¾	54	54½	54½	54¾	54¾	55	55½	55½	55¾	55¾	56	56½	56½	56¾	56¾	57	57½	57½	57¾	57¾	58	58½	58½	58¾	58¾	59	59½	59½	59¾	59¾	60	60½	60½	60¾	60¾	61	61½	61½	61¾	61¾	62	62½	62½	62¾	62¾	63	63½	63½	63¾	63¾	64	64½	64½	64¾	64¾	65	65½	65½	65¾	65¾	66	66½	66½	66¾	66¾	67	67½	67½	67¾	67¾	68	68½	68½	68¾	68¾	69	69½	69½	69¾	69¾	70	70½	70½	70¾	70¾	71	71½	71½	71¾	71¾	72	72½	72½	72¾	72¾	73	73½	73½	73¾	73¾	74	74½	74½	74¾	74¾	75	75½	75½	75¾	75¾	76	76½	76½	76¾	76¾	77	77½	77½	77¾	77¾	78	78½	78½	78¾	78¾	79	79½	79½	79¾	79¾	80	80½	80½	80¾	80¾	81	81½	81½	81¾	81¾	82	82½	82½	82¾	82¾	83	83½	83½	83¾	83¾	84	84½	84½	84¾	84¾	85	85½	85½	85¾	85¾	86	86½	86½	86¾	86¾	87	87½	87½	87¾	87¾	88	88½	88½	88¾	88¾	89	89½	89½	89¾	89¾	90	90½	90½	90¾	90¾	91	91½	91½	91¾	91¾	92	92½	92½	92¾	92¾	93	93½	93½	93¾	93¾	94	94½	94½	94¾	94¾	95	95½	95½	95¾	95¾	96	96½	96½	96¾	96¾	97	97½	97½	97¾	97¾	98	98½	98½	98¾	98¾	99	99½	99½	99¾	99¾	100	100½	100½	100¾	100¾	101	101½	101½	101¾	101¾	102	102½	102½	102¾	102¾	103	103½	103½	103¾	103¾	104	104½	104½	104¾	104¾	105	105½	105½	105¾	105¾	106	106½	106½	106¾	106¾	107	107½	107½	107¾	107¾	108	108½	108½	108¾	108¾	109	109½	109½	109¾	109¾	110	110½	110½	110¾	110¾	111	111½	111½	111¾	111¾	112	112½	112½	112¾	112¾	113	113½	113½	113¾	113¾	114	114½	114½	114¾	114¾	115	115½	115½	115¾	115¾	116	116½	116½	116¾	116¾	117	117½	117½	117¾	117¾	118	118½	118½	118¾	118¾	119	119½	119½	119¾	119¾	120	120½	120½	120¾	120¾	121	121½	121½	121¾	121¾	122	122½	122½	122¾	122¾	123	123½	123½	123¾	123¾	124	124½	124½	124¾	124¾	125	125½	125½	125¾	125¾	126	126½	126½	126¾	126¾	127	127½	127½	127¾	127¾	128	128½	128½	128¾	128¾	129	129½	129½	129¾	129¾	130	130½	130½	130¾	130¾	131	131½	131½	131¾	131¾	132	132½	132½	132¾	132¾	133	133½	133½	133¾	133¾	134	134½	134½	134¾	134¾	135	135½	135½	135¾	135¾	136	136½	136½	136¾	136¾	137	137½	137½	137¾	137¾	138	138½	138½	138¾	138¾	139	139½	139½	139¾	139¾	140	140½	140½	140¾	140¾	141	141½	141½	141¾	141¾	142	142½	142½	142¾	142¾	143	143½	143½	143¾	143¾	144	144½	144½	144¾	144¾	145	145½	145½	145¾	145¾	146	146½	146½	146¾	146¾	147	147½	147½	147¾	147¾	148	148½	148½	148¾	148¾	149	149½	149½	149¾	149¾	150	150½	150½	150¾	150¾	151	151½	151½	151¾	151¾	152	152½	152½	152¾	152¾	153	153½	153½	153¾	153¾	154	154½	154½	154¾	154¾	155	155½	155½	155¾	155¾	156	156½	156½	156¾	156¾	157	157½	157½	157¾	157¾	158	158½	158½	158¾	158¾	159	159½	159½	159¾	159¾	160	160½	160½	160¾	160¾	161	161½	161½	161¾	161¾	162	162½	162½	162¾	162¾	163	163½	163½	163¾	163¾	164	164½	164½	164¾	164¾	165	165½	165½	165¾	165¾	166	166½	166½	166¾	166¾	167	167½	167½	167¾	167¾	168	168½	168½	168¾	168¾	169	169½	169½	169¾	169¾	170	170½	170½	170¾	170¾	171	171½	171½	171¾	171¾	172	172½	172½	172¾	172¾	173	173½	173½	173¾	173¾	174	174½	174½	174¾	174¾	175	175½	175½	175¾	175¾	176	176½	176½	176¾	176¾	177	177½	177½	177¾	177¾	178	178½	178½	178¾	178¾	179	179½	179½	179¾	179¾	180	180½	180½	180¾	180¾	181	181½	181½	181¾	181¾	182	182½	182½	182¾	182¾	183	183½	183½	183¾	183¾	184	184½	184½	184¾	184¾	185	185½	185½	185¾	185¾	186	186½	186½	186¾	186¾	187	187½	187½	187¾	187¾	188	188½	188½	188¾	188¾	189	189½	189½	189¾	189¾	190	190½	190½	190¾	190¾	191	191½	191½	191¾	191¾	192	192½	192½	192¾	192¾	193	193½	193½	193¾	193¾	194	194½	194½	194¾	194¾	195	195½	195½	195¾	195¾	196	196½	196½	196¾	196¾	197	197½	197½	197¾	197¾	198	198½	198½	198¾	198¾	199	199½	199½	199¾	199¾	200	200½	200½	200¾	200¾	201	201½	201½	201¾	201¾	202	202½	202½	202¾	202¾	203	203½	203½	203¾	203¾	204	204½	204½	204¾	204¾	205	205½	205½	205¾	205¾	206	206½	206½	206¾	206¾	207	207½	207½	207¾	207¾	208	208½	208½	208¾	208¾	209	209½	209½	209¾	209¾	210	210½	210½	210¾	210¾	211	211½	211½	211¾	211¾	212	212½	212½	212¾	212¾	213	213½	213½	213¾	213¾	214	214½	214½	214¾	214¾	215	215½	215½	215¾	215¾	216	216½	216½	216¾	216¾	217	217½	217½	217¾	217¾	218	218½	218½	218¾	218¾	219	219½	219½	219¾	219¾	220	220½	220½	220¾	220¾	221	221½	221½	221¾	221¾	222	222½	222½	222¾	222¾	223	223½	223½	223¾	223¾	224	224½	224½	224¾	224¾	225	225½	225½	225¾	225¾	226	226½	226½	226¾	226¾	227	227½	227½	227¾	227¾	228	228½	228½	228¾	228¾	229	229½	229½	229¾	229¾	230	230½	230½	230¾	230¾	231	231½	231½	231¾	231¾	232	232½	232½	232¾	232¾	233	233½	233½	233¾	233¾	234	234½	234½	234¾	234¾	235	235½	235½	235¾	235¾	236	236½	236½	236¾	236¾	237	237½	237½	237¾	237¾	238	238½	238½	238¾	238¾	239	239½	239½	239¾	239¾	240	240½	240½	240¾	240¾	241	241½	241½	241¾	241¾	242	242½	242½	242¾	242¾	243	243½	243½	243¾	243¾	244	244½	244½	244¾	244¾	245	245½	245½	245¾	245¾	246	246½	246½	246¾	246¾	247	247½	247½	247¾	247¾	248	248½	248½	248¾	248¾	249	249½	249½	249¾	249¾	250	250½	250½	250¾	250¾	251	251½	251½	251¾	251¾	252	252½	252½	252¾	252¾	253	253½	253½	253¾	253¾	254	254½	254½	254¾	254¾	255	255½	255½	255¾	255¾	256	256½	256½	256¾	256¾	257	257½	257½	257¾	257¾	258	258½	258½	258¾	258¾	259	259½	259½	259¾	259¾	260	260½	260½	260¾	260¾	261	261½	261½	261¾	261¾	262	262½	262½	262¾	262¾	263	263½	263½	263¾	263¾	264	264½	264½	264¾	264¾	265	265½	265½	265¾	265¾	266	266½	266½	266¾	266¾	267	267½	267½	267¾	267¾	268	268½	268½	268¾	268¾	269	269½	269½	269¾	269¾	270	270½	270½	270¾	270¾	271	271½	271½	271¾	271¾	272	272½	272½	272¾	272¾	273	273½	273½	273¾	273¾	274	274½	274½	274¾	274¾	275	275½	275½	275¾	275¾	276	276½	276½	276¾	276¾	277	277½	277½	27

TABLE E.
NUMBER OF HANGING KNEES
Section 41.

350	400	450	500	700	900	1350
$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	$1\frac{6}{16}$	$1\frac{8}{16}$
$1\frac{4}{16}$	$1\frac{5}{16}$	$1\frac{5}{16}$	1	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$
1	$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{6}{16}$
$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	1
$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$
$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	1	$1\frac{2}{16}$
$2\frac{5}{8}$	$2\frac{3}{4}$	3	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$
$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{1}{2}$

l. as prescribed in *Section 46*, and to be of good quality, well made y driven.

Tons.	To Hold Beams.	To Upper Deck Beams.
	PAIRS.	PAIRS.
150	—	4
200	4	6
250	5	7
300	6	8
350	7	9
400	8	10
450	8	11
500	9	12
550	9	13
600	10	14
650	10	15
700	11	16
750	11	17
800	12	18
900	13	20
1000	14	22
1100	15	24
1350	17	26

	0000	1750	1500	1350	1250	1150	1050	950	00
14	13½	13	12½	12	11½	11	10½	10	0
7	6¾	6¾	6½	6¼	6	5¾	5¾	5½	5½
6	5¾	5¾	5½	5¼	5	5	5	4¾	4¾
14	13½	13	12½	12	11½	10½	9½	9	9
8½	8¼	8	7¾	7½	7¼	7	6¾	6½	6½
18	17¾	17½	17¼	17	16¾	16½	16¼	16	6

TABLE D.

SIZES OF BOLTS, PINTLES OF RUDDER, AND TREENAILS.

Section 46.

TONNAGE	50	100	150	200	250	300	350	400	450	500	700	900	1350
Heel-Knee, Stemson, and Deadwood Bolts	Inches $\frac{14}{16}$	$\frac{15}{16}$	1	1	$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	$1\frac{6}{16}$	$1\frac{8}{16}$
Bolts in Sister Keelsons, Scarphs of Keel (a), Arms of Breast Hooks, Pointers, Crutches, Riders, Hanging and Lodging Knees to Hold or Lower Deck Beams (except in and out Throat Bolts of Hanging Knees, which must be larger), also in and out Bolts of Shelf, Clamp, and Waterway of Hold or Lower Deck Beams, and the in and out Throat Bolts of Upper Deck Hanging Knees.	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	1	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$
Keelson Bolts (one through Keel at each Floor), Throats of Transoms, Throats of Breasthooks, and Throats of Hanging Knees to Hold or Lower Deck Beams	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1	1	$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{6}{16}$
Bilge, Limber Strake, and Through Butt Bolts	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1
Other Butt Bolts	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$
Bolts through heels of cant timbers at fore and after Deadwood. In and out Bolts of Upper Deck Waterway, Shelf and Clamp, also Arms of Hanging and Lodging Knees, except in and out Throat Bolts of Hanging Knees, which must be larger.....	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1	$1\frac{2}{16}$
Pintles of Rudder { The Lower Brace must extend so as to receive not less than Two Bolts on the Planking on each side	$1\frac{7}{8}$	2	2	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	3	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$
Hardwood Treenails	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{1}{2}$

(a) NUMBER OF BOLTS IN SCARPHS OF KEEL:—

In Ships of 150 Tons and under 6 Bolts } These bolts to be of
 " above 150 Tons and under 500 Tons.... 7 do. } Copper or Yellow Metal
 " 500 Tons and above 8 do. } in all cases.

Lloyd's Register of Shipping,
 25th May, 1871.

TABLE E.

NUMBER OF HANGING KNEES
Section 41.

Tons.	To Hold Beams.	To Upper Deck Beams.
150	—	4
200	4	6
250	5	7
300	6	8
350	7	9
400	8	10
450	8	11
500	9	12
550	9	13
600	10	14
650	10	15
700	11	16
750	11	17
800	12	18
900	13	20
1000	14	22
1100	15	24
1350	17	26

N.B.—Bolts to be through and clenched, as prescribed in Section 46, and to be of good quality, well made with suitable heads and be tightly driven.

TABLE F.

MINIMUM DIMENSIONS OF IRON KNEES AND KNEE RIDERS FOR BRITISH NORTH AMERICAN BUILT SHIPS AND FIR SHIPS.—Section 62.

TONNAGE .....Tons	150	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Number of Hanging Knees to Hold or Lower Deck Beams .....Pairs	3 (a)	4	6	8	9	Upwards, one Knee Rider to every Beam, or Knees and Riders as per Section 62.																				
Number of Hanging Knees to Upper and Middle Deck Beams .....Pairs	4	6	7	8	9	10	11	12	13	14	15	16	17	18	Upwards, one to every Beam											
Breadth of Knees and Riders to Hold or Lower Deck Beams .....Inches	3	3	3	3	3	3	3¼	3¼	3½	3½	3¾	3¾	4	4	4¼	4¼	4½	4½	4¾	4¾	5	5	5¼	5¼	5½	5½
Breadth of Upper Deck Knees, where there are two Decks, and of Middle Deck Knees, where there are three Decks .....Inches	3	3	3	3	3	3	3¼	3¼	3½	3½	3½	3½	3¾	3¾	4	4	4¼	4¼	4½	4½	4½	4½	4¾	4¾	4¾	4¾
Thickness of Riders at the joints or butts of the Timbers.....Inches	1¼	1¼	1½	1½	1½	1½	1¾	1¾	2	2	2¼	2¼	2½	2½	2¾	2¾	3	3	3¼	3¼	3½	3½	3½	3½	3¾	3¾
Thickness of Knees to Lower Deck or Hold Beams and Knee Riders at the Angle of the Throat .....Inches	2½	2½	2¾	2¾	3	3	3¼	3¼	3½	3½	3¾	3¾	4	4	4¼	4¼	4½	4½	4¾	4¾	5	5	5¼	5¼	5½	5½
Thickness of Knees to Lower Deck or Hold Beams and Knee Riders at the Throat Bolts..... Inches	1¾	1¾	2	2	2¼	2¼	2½	2½	2¾	2¾	2¾	2¾	3	3	3	3	3¼	3¼	3¼	3¼	3½	3½	3½	3½	3¾	3¾
Thickness of Knees to Upper or Middle Deck at the Throat Bolts Inches (b)	1½	1½	1¾	1¾	2	2	2¼	2¼	2½	2½	2½	2½	2¾	2¾	2¾	2¾	3	3	3	3	3¼	3¼	3¼	3¼	3½	3½
Thickness of Hanging Knees (not Riders) at the ends Inches	5⁄8	5⁄8	¾	¾	¾	¾	7⁄8	7⁄8	7⁄8	7⁄8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Length of Beam Arms of Knees and Knee Riders for Lower Deck or Hold Beams (c)	ft. in. 2 6	ft. in. 2 6	ft. in. 2 9	ft. in. 2 9	ft. in. 3 0	ft. in. 3 0	ft. in. 3 3	ft. in. 3 3	ft. in. 3 3	ft. in. 3 6	ft. in. 3 6	ft. in. 3 6	ft. in. 3 9	ft. in. 3 9	ft. in. 3 9	ft. in. 3 9	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0	ft. in. 4 0

NOTE.—The Bolts in all Iron Riders in Hold, to be not more than twenty-one inches apart on the average.

Standards upon the Beams of such Ships are not admitted as substitutes for Hanging Knees below them.

For sizes of Bolts, see Table D.

(a) Provided the depth of hold be 13ft. or upwards.

(b) Breadth and thickness of Knees for Upper Deck, where there are Three Decks, may be one sixth less.

(c) Beam Arms of Upper and Middle Deck Knees, may be three inches shorter than those of the Lower Deck.

Side Arms of Hanging Knees not to be less in length, than one and a half the length of their Beam Arms. "Jumped Knees" will not be allowed.

Beam Arms of Knees and Knee Riders, which are 3ft. 6in. in length, to have not less than Four Bolts; and shorter than that length, to have not less than Three Bolts.

Side Arms of all Hanging Knees to have at least One Bolt more than in the Beam Arms.

LLOYD'S REGISTER
OF
BRITISH AND FOREIGN SHIPPING.

SUGGESTIONS

FOR
THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE
SHIPS.

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FLOYD'S REGISTER

BRITISH AND FOREIGN SHIPPING

REGISTRATION

THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE
SHIPS

SUGGESTIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS.

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SUGGESTIONS

FOR

THE CONSTRUCTION AND CLASSIFICATION

OF

COMPOSITE SHIPS.

All vessels constructed with iron frames, or part iron and wood frames, and wood planking, to be classed A for a term of years,* according to the timber material used in their construction, as set forth in Table I, provided the workmanship be well executed, subject to the surveys and conditions hereinafter stated.†

VESSELS BUILT UNDER A ROOF.

An additional year will be allowed to vessels built under a substantial and efficient roof, kept in good repair, and which extends on each side beyond the vessel's breadth, and beyond each of her ends to an extent equal to half her midship breadth.

COPPER OR YELLOW METAL BOLTS.

Paragraph No. 1. Two additional years will be allowed to vessels, whether planked with one or two thicknesses, if fastened with wrought copper or yellow metal bolts, from the lower part of keel up to the height of one-fifth of the midship depth of hold, below the upper side of the upper deck and parallel thereto forward and aft, in one, two, or three-decked ships, and below the upper side of the main or tonnage deck in spar-decked ships, but the whole of the fastenings above this height may be of iron, if properly galvanized and doweled or cemented over.

Such ships to be marked C. F. (*Copper fastened*).

Paragraph No. 2. Three additional years will be allowed, provided the whole of the external fastenings from the lower part of keel to the gunwale be of wrought copper or yellow metal bolts, to the entire exclusion of iron.

Such ships to be marked C.F. (*Copper fastened*).

IRON BOLTS AND GALVANIZED IRON BOLTS.

Vessels will be allowed to be fastened with galvanized or plain iron bolts, if efficiently doweled or cemented over; but the butt bolts, and also those which are used in fastening the fore hood ends before the

* The terms of years assigned to *Composite Ships* on the Character A will expire on the 31st December of the last year of the periods assigned to them.

† *Expunging or withdrawal of Character.*—The twelfth, thirteenth, and fourteenth Columns left blank, indicate that the Vessel has never been classed in the Register Book. Three dots ... in Column 13 indicate that the vessel was at one time Classed by this Society, but that the Class has been withdrawn at owner's request. A black line with date under it in Column 14 indicates that, at that date, the Vessel, from reported defects, was not entitled to a Character in the Register Book. A red line with date under it in this Column indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.

iron stem plate, the after hood ends abaft the sternpost plate, extending from the keel up to the height of one-fifth the depth of hold below the upper side of the upper deck, in one, two or three-decked vessels, or below the upper side of the main or tonnage deck in spar-decked vessels, those which fasten the planking to the deadwood, the lower edge of the garboard strakes, and the wood keel, and stem scarphs, must be of wrought copper or yellow metal.

All vessels fastened with galvanized iron to be marked G. I. B. (*Galvanised Iron Bolts*), and with plain iron bolts (I. B.); and in addition all iron-fastened ships will be marked "*Expl. T. S.*" (*Experimental Triennial Survey*).

All vessels fastened with galvanized or plain iron bolts in the bottom, previous to being sheathed with copper or yellow metal, must be sheathed with wood not less than 1½ in. thick, wrought hot on the best hair felt, and properly rabbeted into the stem, sternpost, keel, and into the planking at its upper edge; efficiently fastened to the bottom planks with yellow metal or copper nails, arranged to come between the frames, and be well caulked. The condition of the bolts and caulking of the bottom and planking to be ascertained at the periodical Surveys as per Section 43. The wood sheathing to be allowed to remain on the bottom as long as the bottom planks, bolts, and caulking prove satisfactory.

SURVEYS WHILE BUILDING. SPECIAL SURVEY.

Section 1. 1. The Surveyors are to examine the whole of the materials and the workmanship as it progresses, from the laying of the keel to the completion of the vessel, and to point out as early as possible anything that may be objectionable.

2. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

COMMON SURVEY.

Section 2. First.—Examination of the wood keel, stem, sternpost, deadwood, and frames before they are painted or coated.

Second.—Of all the beams, stringers, plates, &c., when in place, riveted-up ready to receive the planking.

Third.—When the vessel is planked outside, dubbed fair, and all the fastenings completed, but before she is either caulked, coated, or cemented, so that the inside and outside of the planking, and the bolts and their nuts, may be carefully examined.

Fourth.—When the vessel is caulked, but before the bolt-heads are cemented or have dowels fitted over them.

Fifth.—When the vessel is completed, launched, and equipped.

SUGGESTIONS AS TO THE BUILDING OF COMPOSITE SHIPS. QUALITY OF IRON, MAKER'S NAME, AND WORKMANSHIP.

Section 3. 1. The whole of the iron to be of good malleable quality, to be capable of bearing a longitudinal strain of twenty tons per square inch, and all plate, beam, and angle iron, to be legibly stamped in not less than two places with the manufacturer's trade mark, or his name, and the place where made, which is also to be stated in the Report of Survey.

2. Any brittle or inferior iron, defective planking, timber, or other objectionable materials to be rejected.

3. The workmanship to be well executed, and submitted to the closest inspection before coating or painting.

RIVETS AND RIVETING.

Section 4. 1. The rivets to be of the best quality, and to be of the diameter as per Table H, the rivet holes to be regularly and equally spaced, and carefully punched opposite each other in the adjoining parts from the faying surfaces in the laps, lining pieces, butt-straps, and frames, and to be countersunk where required; the rivets not to be nearer to the butts or edges of the plating, lining pieces to butts, or of any angle iron, than a space equal to their own diameter, and not to be farther apart from centre to centre than five times their diameter, or nearer than four times their diameter from centre to centre, and to be spaced through the frames and outside plating, and in reversed angle iron a distance equal to nine times their diameter from centre to centre.

2. All butts of iron plating, excepting those of poops and top-gallant forecastles, to be at least double riveted, and a space equal to twice the diameter of the rivets to be between each row; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

SCANTLINGS.

Section 5. 1. The scantlings given in Table H are intended for ships the length of which, measured from the fore part of stem to the after part of the sternpost, on the range of the upper deck, does not exceed ten times their depth of hold, taken from the upper part of the floors to the top of the upper deck beams, or seven times their moulded breadth.

2. In vessels exceeding ten depths, or seven breadths in length, the builders are to submit their plans for giving them additional longitudinal strength to the Committee, through the Resident Surveyors, who are to express their opinions thereon.

3. The depth for defining the proportions of spar-decked vessels is to be measured from the top of the floor-plates to the upper side of the middle or tonnage deck beams. (*See* Section 24.)

WOOD KEEL.

Section 6. The wood keel to be of the dimensions set forth in Table H, to be free from all defects, the scarphs to be either vertical or horizontal, and to be tabled, the width of the tabling to be one-third the siding or moulding of the keel, as the case may be, and from $\frac{3}{4}$ of an inch to $1\frac{1}{4}$ inch deep, according to the size of the keel, and bolted with copper or yellow metal bolts, which are to be driven on and clenched on rings of the same metal; the bolts are to be in size and number as required by Table K.

GARBOARD STRAKE.

Section 7. The garboard strakes not to be less than two-thirds the depth of keel prescribed in Table H, and properly rabbeted into it, to be fitted closely to the iron keel plate, and to be of sufficient width. The butts of the garboard strake to have not less than four feet six inches shift from the butts of the garboard strake on the opposite side of the vessel, nor less than the same shift clear of the keel scarphs. (*For* bolting, *see* Section 33.)

STEM AND STERNPOST.

Section 8. The stem and sternpost to be of the dimensions set forth in Table H, and of materials according to class as prescribed in Table I. Where necessary to scarph the stem, it must be a flat scarph, and its length not less than seven-tenths of that prescribed in Table K for keel scarphs, and tabled and bolted in the same manner. The hood ends to be well and efficiently rabbeted into the stem and sternpost.

APRON, INNER STERNPOST, AND DEADWOOD.

Section 9. The apron, inner sternpost, and deadwood, to be of materials according to class as prescribed in Table I; the apron and inner sternpost to be of sufficient siding and moulding for the knight-heads and counter timbers respectively, to be secured to them, and to take the hood end fastenings.

SPACING OF IRON FRAMES.

Section 10. The spacing of the iron frames not to exceed 18 inches from moulding edge to moulding edge all fore and aft; a four feet length of angle iron, the size of the frame, is to be riveted to each floor and to the keel plate, back to back with the frame.

KEEL PLATE.

Section 11. The keel plate to be of the breadth and thickness prescribed in Table H, and to be made continuous up the apron and up the inner sternpost as high as practicable, but in all cases to extend above the lower deck or hold beam stringer angle iron. Forward and aft the plate is to be curved to the form of the bearding line, and to be one-sixteenth of an inch thicker than prescribed in the Table, where it passes over the deadwoods, apron, and inner sternpost; and to be sided as required by the form of the vessel, to have an angle iron of the size given in Table H for stringer angle irons riveted on each edge, flanged to the form of the vessel to receive the plank fastenings. The keel plate to maintain its breadth for three-fifths the length of the keel in midships, and then to be gradually reduced until its edges conform with the flange of the angle iron on the keel plate forward and aft; the butts of the keel plates to be shifted clear of the keel scarphs.

FRAMES.

Section 12. The frames to be of the dimensions set forth in Table H, and the narrow flange to be of a parallel thickness, and the bolts are to be so placed that the nuts of the screw bolts may fit closely to the frames; the frames to be in as long lengths as possible, fitted and riveted on to the keel plate, and extended as near to the middle line as practicable, according to the plan of construction adopted, and in all cases to extend to the gunwale, and where raised quarter decks, poops, forecastles, and spar decks are constructed to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; if the frames be welded, the welds to be perfect with not less than four feet shifts from the welds of next frames, or, if butted, to have not less than four feet shifts with four feet lengths of angle iron of the same size as the frames fitted back to back, riveted to them, and secured to the outside planking.

FLOOR-PLATES.

Section 13. 1. The floor plates to be in thickness according to Table H, but at each end of the vessel, for one quarter of her length, they may be reduced one-sixteenth of an inch where the midship

floor-plates are six-sixteenths and under ten-sixteenths of an inch, and two-sixteenths of an inch where the plates are ten-sixteenths and above in thickness.

2. The depth of the floor-plates at middle line to be regulated by the following rule, viz., to the vessel's depth, measured from the top of the keel to the top of the upper or spar deck beams amidships add the extreme breadth of the vessel, two-fifths of that sum in inches to be the depth of the floor-plates at the middle line well fore and aft, but at the extreme fore and after ends they must be deeper, so as to form an efficient connection between the two sides of the vessel.

3. The floor-plates are to extend up the bilges not less than to a perpendicular height of *twice* and *a half* the depth of floors amidships, from upper side of keel at middle line; and in no case to be less moulded in any part than a fair taper between the depth at middle line, and the moulding at their extreme ends, which is to be not less than the moulding of the frames. The ends of the floors to maintain the height prescribed amidships, for one quarter of the vessel's length; they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level, which place is to be determined by the form of the vessel, and from that point to the vessel's ends they are to be gradually increased in depth, so as to efficiently connect the sides of the vessel; the upper parts of the floors forward and aft are to be high enough to give ample room between the reverse frames on each side of the vessel for fitting the keelson angle irons.

4. In vessels having considerable rise of floor, the depth of the floor-plates on a square at the quarter of the vessel's extreme moulded breadth, set out from the middle line, is to be not less than three-fifths the depth of the floor-plate at the middle line, and the floor-plate is to be extended up the bilges by a fair taper from middle line, until it terminates at the moulding of the frames.

5. A floor-plate to be fitted and riveted to every frame and to be extended across the middle line, but, where a vertical centre plate is adopted at middle line, then the floor-plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames.

6. When floors extend from side to side, and are made in two lengths, the butts are to have double butt-straps, one on each side of the floor-plates, and three-fourths the thickness of the floor-plates, or else the floor-plates must be lapped and treble riveted.

WATERCOURSES.

Section 14. Watercourses are to be formed through all the floor-plates, on each side of the middle line, and at the bilges above the frames, so as to allow water to reach the pumps freely, and also through the vertical centre plate, and intercostal keelsons when such keelsons are adopted.

REVERSED FRAMES.

Section 15. Reversed angle irons on frames to be in size as per Table H. All vessels under 200 tons to have reversed angle iron riveted to every frame and floor-plate across the middle line, extended to the height of the upper part of the bilge, and to the gunwale on alternate frames, and to have double reversed angle irons in way of all keelsons and stringers in hold; and in addition all vessels of 200 tons and upwards to have reversed angle iron extended to the upper deck beam stringer on alternate frames, and, where raised quarter decks and spar decks are constructed, to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the

curve; and on the remaining frames reversed angle irons are to be fitted to above the height of the lower deck or hold beam stringer angle iron if the vessel has two decks or tiers of beams, and to above the height of the middle deck beam stringer angle iron if the vessel has three decks or tiers of beams; the rivets for securing the reversed angle iron to the frames and floor-plates to be in diameter as specified in Table H, and be spaced not to exceed a distance of nine times their own diameter from centre to centre; butts of reversed angle iron to be secured with butt-straps.

MIDDLE LINE KEELSON.

Section 16. 1. The middle line keelson, if of single plate, and standing above the floor-plates, to be of the thickness prescribed in Table H, to be two-thirds of the depth of floor-plates, and to have an angle iron, of the size given in Table H, fitted and riveted on *each* side, top and bottom, extending all fore and aft, the bottom angle irons to be riveted to a foundation plate the breadth of which is to be not less than three and a half times the flange of the angle iron fitted upon it, and the top angle irons to a rider plate on the top, the breadth of which is to be not less than the breadths of the flanges of the angle irons attached to them and the thickness of the keelson plates combined, to be properly shifted, and to be of the thickness given in Table H for box keelson plates, and the lower plates to be riveted to double reversed angle irons attached to each of the floors; but the foundation plate may be dispensed with if the combined widths of the horizontal flanges of the bottom angle irons are equal to the breadth prescribed for the foundation plate, and double riveted to the angle irons on the floors.

BOX KEELSON.

2. If a box keelson be adopted, it is to be formed of plates, properly shifted, of the thickness given in Table H, with a foundation plate, the depth of the box to be not less than two-thirds the depth of the floor-plates, and the breadth of it two-thirds of its depth; the lower angle irons of the box keelson to be of the size given for the frames, and the top ones the size of the reversed frames, and the keelson to be well stayed in way of the masts.

INTERCOSTAL KEELSON.

3. If an intercostal keelson be adopted, it is to be of the thickness prescribed in Table H, and riveted to vertical angle irons of not less size than the reversed frames attached to all floor-plates, the plates to extend from the keel plate to the top of the floors, a bulb plate of not less thickness than the lower deck beams, or other bars of equal strength, to be let down below the top of the floors sufficiently for the intercostal plates to be riveted to them; in all cases these bars are to be fitted between two longitudinal angle irons on the floors, extending all fore and aft, of the size given for keelson angle iron in Table H, and riveted thereto. The intercostal plates to be fitted close to the floors, and to the flat keel plate.

VERTICAL CENTRE PLATE.

4. If the middle line keelson be formed of a vertical centre plate, extending from the keel plate to the top of the floors, it must be not less in thickness than that given in Table H, riveted to two fore and aft angle irons of the size given for stringer angle irons in Table H, attached to the keel plate. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to double vertical angle irons, of not less size than the reversed frames, riveted to their ends, and to the vertical centre plate, there is to be a flat keelson plate of the same breadth and thickness as to the keel plate, riveted to double reversed

angle irons on the upper edge of floors, and to two fore and aft angle irons of the size given for stringer angle irons in Table H, on the top edge of the vertical centre plate; but, should the vertical centre plate be extended above the upper edge of the floors, then it is to be riveted to two fore and aft angle irons of the size given in Table H, for stringer angle irons, and to two flat plates of the thickness given for box keelson plates, and half the breadth of the keel plates, one on each side of the middle line, which are to be well riveted to double reversed angle irons on the top of each floor, one of these reversed angle irons to reeve through the vertical centre plate, and in all cases the vertical centre plate to be extended to the stem and sternpost plates, and riveted thereto.

BILGE KEELSONS AND STRINGERS.

Section 17. 1. All vessels to have bilge keelsons fitted and riveted to double reversed angle irons to each floor, secured in an efficient manner, and to extend all fore and aft, and placed at the lower turn of the bilges according to the form of the bottom; to be formed of double angle irons of the size given in Table H, with bulb plate not less than the size given for hold beams fitted between them for one-half the length of the vessel in midships; and in addition, in vessels of 300 tons and under 700 tons, a stringer will be required between the bilge keelson and hold beams, formed of double angle irons back to back, well riveted to double reversed angle irons and to each other; at the fore and after ends of the vessel the bilge keelson and stringer angle irons to be efficiently connected by plates forming hooks and crutches, which are to be properly riveted to the apron and inner sternpost plates; and such vessels to have intercostal plates fitted midway between the main and bilge keelsons, for three-fifths the vessel's length of keel in midships, these plates to be the thickness of the floor-plates, and connected thereto with angle irons of the size of the reversed frames.

2. In vessels of 700 tons and under 1,000 tons, in addition to the foregoing, a bulb plate, not less in thickness than the hold beams, is to be let down and riveted to the side intercostal plates, to be inserted between double angle irons on the top of the floors of the size given for stringer angle irons in Table H, and to be extended for three-fifths the length of the keel in midships, but the double angle irons to extend as far forward and aft as practicable.

3. In vessels of 1,000 tons and upwards, of a depth not requiring orlop beams, in addition to the foregoing, another stringer must be introduced formed of double angle irons fitted back to back to extend fore and aft, and riveted to double reversed angle irons and to each other; this stringer and the one below it are to be arranged so as to be equally spaced between the bilge keelson and hold beams, and a foundation plate, of the same thickness as the floors, is to be fitted for three-fifths the vessel's length of keel amidships under the bilge keelson, to be riveted to double reversed frames to the floors, and to which the bilge keelson is to be riveted. The breadth of the foundation plate is not to be less than three and a half times the flange of the angle iron fitted upon it.

4. Where bulb iron is used for keelsons or stringers, the joins to be overlapped and riveted; the length of the overlap must not be less than the depth of the bulb plate, but iron of other form than bulb may be used for them if of equal strength.

5. All angle irons for keelsons and stringers are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron or plate iron not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than the angle irons they connect.

SPACING OF BEAMS.

Section 18. 1. The spacing of the upper deck beams in no case to exceed 4 feet 6 inches from centre to centre.

2. Vessels of 11 feet depth of hold and under, to have a stringer formed of double angle irons back to back, of the size given in Table H, placed midway between the bilge keelson and deck beams, fitted and riveted to reversed angle iron attached to each frame, to extend all fore and aft, and connected by plates at the ends forming hook and crutch, which are to be secured to the apron and inner sternpost.

3. Vessels over 11 and under 13 feet depth of hold to have a hold beam stringer plate of the same thickness as the upper deck stringer plate, but only two-thirds its breadth, efficiently secured to the side by an angle iron riveted to it and to the reversed frames of the size given in Table H for stringer angle iron, to extend all fore and aft, and to be properly connected at the fore and after ends. Bracket or knee plates to be fitted and riveted to the stringers at alternate frames on the under side, and the inner edge of the stringer plate to be stiffened by an angle iron of the same size as given for the reversed angle iron on the frames; or, if preferred, a stringer may be formed of bulb plate of the size given for hold beams fitted between two stringer angle irons, passing all fore and aft, properly riveted to double reversed angle iron on the frames, and to each other, or a stringer may be introduced of any other form of equal strength.

4. Vessels of 13 feet and under 15 feet depth of hold to have a hold beam under every alternate upper deck beam.

5. Vessels of 15 feet depth of hold and under 18 feet to have hold or lower deck beams spaced not more than 4 feet 6 inches, and 9 feet from centre to centre alternately, and always to be placed under upper deck beams.

6. And, in vessels of 18 feet depth of hold and above, a hold or lower deck beam to be placed under every upper deck beam.

PANTING (TO PREVENT).

7. In vessels exceeding 12 feet in depth from the lower side of the lower deck beams, and having fine ends, extra beams will be required both forward and aft between the lower deck beams and floors to prevent "panting," the sizes, arrangement, and security of them to be to the satisfaction of the Surveyors.

TWO-DECKED VESSELS WITH ORLOP BEAMS.

8. All two-decked vessels exceeding 24 feet in depth from the top of the floors to the upper side of the upper deck beams, and three-decked vessels exceeding 24 feet to the upper side of the middle deck beams, and where the depth from the under side of the lower deck beams exceeds 15 feet, such vessels to have orlop beams under every second lower deck beam with a stringer plate on their ends, of the same breadth and thickness as the lower deck stringer, passing all fore and aft, supported by brackets riveted to every other frame between the beams; the orlop beams to be secured to lugs welded to the lower deck beam pillars; but, in the case of flush-deck ships, a depth of 25 feet will be allowed, provided the lower hold does not exceed 16 feet in depth from the under side of lower deck beams. Should a house be constructed on such flush-deck ship, for lodging crew or for store room, the same not to extend within 10 feet of the sternpost.

THREE-DECKED VESSELS.

9. In vessels having three decks, viz., upper, middle, and lower, and where cargo may be carried on the middle and lower decks, the beams, iron sheerstrake, upper deck stringers, and stringer angle irons and flat of upper deck are to bear the same proportion to the vessel's dimensions as in those having two decks, and the middle and lower deck beams, and stringers, are to be the same size in proportion to the vessel's length and breadth, as they would be in the lower deck of a vessel having only two decks; but one-sixth reduction will be allowed in the thickness of the outside planking, for one-fifth of the depth of hold below the upper deck stringer.

10. In all cases the middle deck is to be perfectly laid and caulked.

BEAMS.

Section 19. 1. Beams to be of bulb plate with double angle irons on the top edge, or of T bulb iron, or of any other approved form of equal strength.

2. The upper deck beams to be one quarter of an inch in depth to every foot in length of the midship beam, and to be in thickness one-sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added; if of T bulb, the united breadth of the top flanges to be not less than three-fourths the depth of the beam, and, where beams are formed of bulb plate with double angle irons on the top edge, the flanges of each of the angle irons are not to be less in their united breadth than three-fourths the depth of the beam, and to be one-sixteenth of an inch in thickness for every inch of the two sides of the angle iron.

MIDDLE-DECK, HOLD, AND ORLOP BEAMS.

3. Middle-deck, hold, and orlop beams to be one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams.

4. All beams to be efficiently connected to the frames by bracket ends, or knee plates, the arms of each to be not less than twice and a half the depth of the beams in length, and of not less thickness than the beams.

PILLARS.

Section 20. All beams for at least three-quarters the length of the vessel in midships to be pillared, and in addition, the beams under the bowsprit, pall bitt, windlass, and capstan are to be pillared; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper deck, or spar deck, and to be of the sizes given in Table H.

ENGINE-ROOM AND BOILER SPACE.

Section 21. In the construction of steam vessels, care must be taken that the engine and boiler bearers are properly constructed, and where they might interfere with the longitudinal strength of the vessel they must be extended a sufficient distance beyond the engine and boiler space to compensate for such interruption; and, after the machinery and boilers are fitted, as many hold or lower deck beams are to be introduced as may be practicable, and knee or bracket plates are to be added and riveted to the stringer plates and to alternate frames which have no beams in the said space, and the vessel is to be otherwise made secure where necessary in the engine room, to the satisfaction of the Surveyors.

RAISED QUARTER-DECKS.

Section 22. 1. The frames in all cases, and reversed angle iron on alternate frames, where practicable, are to extend to the raised quarter-deck stringer.

2. A reduction of one-half in the breadth and one-fifth in the thickness will be allowed for the sheerstrake of the raised quarter-deck, and one-fifth in the scantlings of the beams, stringers, stringer angle iron, and flat of deck of raised quarter-deck, from that given in Table H for the upper deck of such ships; one-fifth reduction will also be allowed for the outside planking, or plating, of the raised quarter-deck from that given for topsides in Table H.

3. The upper deck beam stringer plate is to maintain its breadth to the break of the quarter-deck, and then it may be gradually reduced in breadth until it terminates at the sixth frame abaft the break, and the upper deck sheerstrake plate is to extend to the stern.

POOPS AND FORECASTLES.

Section 23. 1. In full poops and top-gallant forecastles, the frames are to be extended to their stringer plates; a reduction of one-fourth will be allowed from the dimensions required by Table H for the upper deck sheerstrake, stringer plate, angle iron on stringers, beams, and flat of deck; the same reduction will be allowed for the outside planking, or plating, of the poop or forecastle, from the thickness given for topsides in Table H; where plating alone is adopted, it need not in any case exceed six-sixteenths of an inch in thickness, and may be single riveted. An iron or wood spirketting to be fitted and efficiently secured and caulked in the poop and forecastle, to prevent water from going into the 'tween decks. The united lengths of poop and forecastle not to exceed three-fifths of the entire length of the upper deck.

2. Where the poop or the forecastle is constructed of a rounded form at the gunwale, the frames need not extend beyond the lower part of the curve, and the beams may be of plain angle iron not less in dimensions than the size required in Table H for the main frames, one to be placed to every alternate frame, to scarph the main frames with not less than two-feet lengths and be properly riveted to them; the breast beams are not to be less in size than the angle iron for stringers prescribed in Table H, with an angle iron of the size of the reversed frames riveted to them, and the rounded gunwale when not intended to be planked over, its plating must be of the thickness required for sheerstrakes of poops; but, when intended to be planked over, the thickness prescribed for the stringer plates on beams of poops will be sufficient; in either case the plating must extend the breadth of the rounded form, and in such cases stringers on beam ends will not be required.

TONNAGE, HAVING REFERENCE TO SCANTLINGS, &c.

3. In flush-decked vessels having either one, two, or three decks (not being spar or awning decked) the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull and also the equipment of the vessel.

4. In vessels having a *raised quarter-deck*, or a poop, or top-gallant forecastle, or deck houses, or awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull; but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the*

addition of the tonnage of the space required for propelling power, is to regulate the equipment, and also the size of the main piece of rudder and windlass, and the keel and keelsons and their number, and the scantling of the stringer plates on the upper and lower deck beams, and the requirements as to double riveting.

5. But, in vessels where the tonnage of the erections above the tonnage deck is less than that required for crew space, *then the difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage cut on the main beam, for the tonnage that is to regulate the equipment and the size of the main piece of rudder and windlass, and the keel and keelsons and their number, the scantling of the stringer plates on the upper and lower deck beams, and the requirements for double riveting.

SPAR-DECKED VESSELS.

Section 24. 1. A spar-decked vessel is one having three decks or tiers of beams, where the space between the main and the spar deck is to be used only for the accommodation of crew and passengers, or to enclose the engine openings of steam vessels. The total depth of such vessels, measured from the top of floor-plates to the top of spar deck beams in midships, must not exceed thirteen-sixteenths, nor be less than twelve-sixteenths of the ship's extreme breadth. All frames and reverse angle irons on alternate frames are to extend to the spar deck stringer plate, except when constructed with a rounded form at the gunwale, then they may terminate at the lower part of the curve, but the reverse angle irons on the remaining frames are required to extend above the height of the main deck waterway or spirketting; in such ships the gross tonnage below the main or tonnage deck is to regulate all scantlings below this deck, but the total tonnage is to regulate the scantlings of the keelsons and their number, the stringers in the hold, the size of the main piece of rudder, and windlass.

2. These vessels are to have a main or middle complete deck, perfectly laid and caulked, and a main or middle deck iron sheerstrake, each of the thickness prescribed by Table H, and the main deck stringer plate is to be fitted and connected to the iron sheerstrake by angle iron between the frames of the size given for stringers, and in addition an inner stringer angle iron passing continuously fore and aft must be riveted to the reversed frames and to the main deck stringer plate. The upper part of the sheerstrake is to be not less in height than the main deck waterway or spirketting, as the case may be, and the space between the waterway, or spirketting, and the sheerstrake, all fore and aft, is to be filled in and made water-tight.

3. In such vessels a reduction of one-fourth from the dimensions required by Table H for the corresponding parts in the range of the upper deck in ships with two decks will be allowed from the dimensions of all beams, stringers, thickness of deck, and the outside planking, or plating, from the main deck upwards. If plating alone be adopted between the main and spar decks, the thickness need not exceed six-sixteenths of an inch in any case, the butts to be *double* riveted, but the edges may be single riveted.

4. When the spar deck is constructed of a rounded form at the gunwale, the beams may be of plain angle iron, if fitted to alternate frames, not less in dimensions than the sizes required in Table H for the main frames, to scarph the main frames with not less than two-foot lengths, and be properly riveted to them. All hatchway and mast beams are to be of increased strength, and if of plain angle iron not to

be less than the sizes given for stringer angle irons in Table H, with other angle irons of the size of the reversed frames riveted to them back to back. The rounded gunwale to be plated and properly constructed to the satisfaction of the Surveyor.

5. Deck houses or other erections will be allowed on a spar deck, but only to the extent of one-tenth its total superficial area; they are not to exceed seven feet in height, nor be placed nearer to either end of the vessel than one-fifth of her extreme length.

6. Vessels to which the Rule applies as regards an entire spar deck, will be noted in the Register Book thus, "*Spar deck.*"

IRON SHEERSTRAKE.

Section 25. 1. The iron sheerstrake to be one inch in breadth for every six feet of the vessel's length for half her length in midships, and to be of the thickness given in Table H; it may then be gradually reduced in breadth and in thickness to three-fourths of the midship breadth and thickness at her ends.

2. The butts of the iron sheerstrake in all cases to be shifted clear of the butts of the stringer plates on the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates where practicable to be not less than nine feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadths, but carvel plated and single riveted; butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrake to be fitted less than two-thirds of the breadth required by the Rule for sheerstrake, below the upper deck stringer plate. The butt-straps in all cases to be in one piece, whether fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. (*See Section 30.*)

IRON BILGESTRAKE.

Section 26. The bilgestrake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in midships, and from thence to the ends of the vessel they are to be reduced gradually to one-half their midship breadth; the thickness of the plates to be as prescribed in Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for floorheads, such position for the bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be extended to the ends of the vessel in accordance with her form, and properly riveted to the frames.

DIAGONAL PLATES ON FRAMES.

Section 27. The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and fitted in pairs, transversely, all fore and aft, at an angle of 45° , with the butts of each pair meeting between the frames; to be of the thickness given in Table H, and connected to the sheer and bilgestrake plates by butt-straps, double riveted, and to be efficiently riveted to each other, and to each frame they cross.

STRINGER PLATES ON ENDS OF BEAMS.

Section 28. 1. All vessels to have stringer plates of the thickness given in Table H upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three-decked vessels, to be in width one inch for every seven feet of the vessel's entire length, for half her length in midships and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width

in midships; in no case, however, is the width in midships to be less than eighteen inches. The stringer plates are to be riveted to the beams and properly shifted, fitted home, and riveted to the iron sheerstrake with an angle iron of the dimensions given in Table H, and the roughtree stanchions are not to pass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to three-fourths the midship breadth of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the dimensions given in Table H, extending all fore and aft, riveted to reverse angle iron on each frame and to the stringer plates.

2. In cases where a deck is not laid, and the width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such reduction be fully compensated for.

3. All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron, or plate iron, not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than that of the angle iron they cover.

GUTTER WATERWAYS.

4. Upper deck gutter waterways are to be flooded to ascertain if there be any leakage, and when completed they are to be properly cemented.

TIE-PLATES.

Section 29. 1. All vessels are to have tie-plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition thereto the beams of the upper and middle decks in three-decked or spar-decked vessels, and of the upper deck in vessels of one or two decks, must have tie-plates fitted from side to side diagonally, in number, one pair for about every thirty-five feet of the vessel's length; these plates in both cases must not be less in width than once and a half the depth of the beams of their respective decks, and of the thickness required for stringer plates; they are to be well riveted to each other and to the beams and stringers, and to have intermediate fastenings into the deck plank between the beams. In all cases their butts to be chain riveted.

2. Upon hold beams where a deck is not to be laid, a tie formed of double angle iron, of the size given for the main frames of the ship, may be fitted each side of the hatchways in lieu of tie-plates; but, if the beams are made of such additional strength laterally as not to require the support given by the said angle irons or tie-plates, double angle irons of the above size fitted at the centre line from opening to opening may be substituted.

HATCHWAYS AND MAST PARTNERS.

3. All hatchways and mast holes are to be properly framed to receive half beams where required, and the latter to have mast partners at each tier of beams (except at orlop beams), the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than three times the diameter of the masts; these plates are to be well riveted to each other, and to the beams, and angle iron carlings; and at the decks, where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast holes. The mast holes, skylights and companions must be properly secured to the satisfaction of the Surveyors. Where wood comings are fitted, plates are to be riveted to the beams to which the deck ends are to be fastened.

SKYLIGHTS.

4. The skylights to engine-rooms, and the comings to which they are attached, are in all cases to be substantially constructed, and efficiently fastened to the beams, and, whether of iron or wood, are not to be less than two feet six inches above the upper deck in one or two-decked vessels, and one foot six inches above spar or awning decks. The skylights to be securely attached to the comings, and the glass in them should be very strong, from three-eighths to half an inch thick, protected by a strong guard of iron rods or by a framework of wire; in addition, deadlights of either iron or wood should be fitted having bullseyes in them, and arrangements made for their efficient security in bad weather. Strong tarpauling covers are in all cases to be provided. In spar-decked vessels, and those having either a poop, awning deck or bridge house, with the engine room beneath, the hatchways in the upper deck are to be enclosed by iron trunk bulkheads, not less than five-sixteenths of an inch thick, strengthened by angle iron and extended from the upper deck to the beams above, to which they are to be secured. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least eighteen inches above the upper deck, and arrangements made for their efficient security.

COAL BUNKERS.

5. Coal bunker pipes, where practicable, are to be formed so as to be at least six inches above the upper deck, fitted with gratings and lids, the latter to have studs to fit in openings made in the pipes for their security, the pipes to be so formed that tarpauling may be securely lashed over them. Where it is necessary to fit flat coal bunker scuttle lids flush with the deck, they must be secured by a bar, or other approved fastening.

BUTT-STRAPS.

Section 30. Butt-straps in all cases, except those of floor-plates (*see* Section 13), to be one-sixteenth of an inch thicker than the plates they connect, and to be fitted with the fibre of the iron in the same direction as that of the plates, and riveted as per Section 4.

BUTT-PLATES OF OUTSIDE PLANKING.

Section 31. The plates to which the butts of the outside planking are to be secured must be of the breadth of the planks, extending from frame to frame, efficiently riveted thereto, and of the thickness given in Table H; but on the bows and quarters, or wherever else the plank ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed.

PLANKING.

Section 32. 1. The material for planking to be in accordance with class in Table I, to be thoroughly seasoned, quite free from sap, wane, or other defects, to be wrought with the heart side to the frames, and with not less than three strakes between the butts, without step butting, and with not less than six-foot shifts; the garboard strakes to be shifted, and of the thickness given in Section 7; the bottom planking is not to be less in thickness than prescribed in Table H, from the garboard strakes up to within a fifth of the depth of hold set down below the upper deck stringer plate; from thence to the plank-sheer to be in thickness as prescribed in Table H for topsides; or, if preferred, the bottom planking may retain its thickness up to within a fourth of the depth of hold set down below the upper deck stringer plate, and from thence to the plank-sheer be gradually diminished in thickness to that prescribed in Table H for topsides; the thickness of the wood sheerstrakes may be the thickness of the iron sheerstrake they cover less than that prescribed by Table H.

2. Outside planks (except the garboard strakes) are not to be more than twelve inches broad; they are to be fitted quite close to the frames and plates, and to each other at their inner edges, and wrought with proper seams outside in proportion to their thickness; the hood ends may be reduced one-fifth from the thickness given in Table H at the stem or sternpost, and one-third at the buttock. The caulking edge of the keel seam, and hood end seams of the planking at the stem and sternpost, need not exceed from two and a half inches to four inches in proportion to the tonnage of the vessel; which can be arranged by trimming the back rabbet from the bearding line to the rabbet line, as required, so as not to unnecessarily reduce the keel, stem, and sternpost. Funnels or pads are in no case to be used.

BOLTS.

Section 33. 1. The bolts to be not less than the sizes given in Table K; the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

2. The wood keel to have a vertical bolt through the keel plate between each frame. The stem, sternpost, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel.

3. The screw-pointed bolts for fastening the planking, when less than five inches thick, to be of such form under the heads as will prevent them from turning; their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness; the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths of the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred.

4. All outside planks ten inches broad and above, to be double fastened; eight inches and a half and under ten inches, double and single fastened alternately; and under eight and a half inches single fastened; and all butts to be double fastened.

5. The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one-fifth the depth of hold set down below the upper deck stringer plate, are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the planksheer they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and in the bottom they are to be carefully covered (after the seams in the bottom are all caulked) with turned well-seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be driven with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used, the sinking of them within the surface of the planking to be optional to the above extent.

PLANKING OF TWO THICKNESSES.

Section 34. 1. If the vessel is to be planked with two thicknesses, the whole of the inside thickness must be of material required by Table I for the upper part of the vessel, and the outside thickness, if worked longitudinally, must be of the same material as is prescribed for a vessel constructed with a single thickness of planking, but if the outside thickness is to be worked diagonally, American Rock Elm may be used. If either or both thicknesses be worked longitudinally, or diagonally, each thickness need

only be one-half that prescribed in Table H, but thick garboard strakes will be required to be fitted and fastened as in the case of vessels with a single thickness of planking. When the outside thickness is worked diagonally, a longitudinal strake of plank must be rabbeted into the garboard strake, and the ends of the diagonal planks butted against it; there must also be one or more longitudinal strakes of plank of the materials prescribed in Table I for the upper part of the vessel, fitted above the upper ends of the diagonal planking; and, if the topsides be of a single thickness, the upper edge of the said longitudinal planking must be partly let into the topside plank or be rabbeted into a solid strake, so that it may be efficiently caulked. In all such cases both thicknesses must be caulked, and the outer thickness wrought hot on the *best hair felt*.

2. If both thicknesses of plank be worked diagonally, transversely to each other, from keel to gunwale, the bilge and diagonal plates may be dispensed with; but, where the thicknesses are otherwise arranged, the bilge and diagonal plates must be fitted as in vessels with single thickness; the diagonal plates may, however, be extended to ten feet apart on a square with three pairs crossing each other in the centre.

3. When the inner thickness of plank is wrought diagonally, all the planks must be double fastened to the frames, but, when wrought longitudinally, they may be fastened as per Section 33, the bolts in either case must be of the size prescribed in Table K. The outer thickness of plank must be secured to the inner by nut and screw bolts, or else by wrought copper bolts, driven through the inner thickness and clenched inside upon copper or yellow metal rings; a reduction of one-fifth of the diameter from that prescribed in Table K will be allowed when nut and screw bolts are used for fastening the outer thickness of plank, and a reduction of one-third when it is intended to use wrought copper and to clench the bolts of this thickness.

4. In vessels claiming the additional period for copper or yellow metal bolts, the fastenings in both thicknesses must be of the description and to the height required in those having only one thickness. Where two thicknesses of planking are adopted, dowelling will not be allowed in either thickness.

5. When the planking is composed of two thicknesses, the outside thickness of planking should not exceed ten inches in breadth, and may be single fastened, but the fastenings are not to exceed twenty inches apart on an edge; if, however, planks are used in the lower part of the bottom more than ten inches but not exceeding twelve inches in breadth, their fastenings are not to exceed eighteen inches apart on an edge.

6. All iron work, and all iron and wood surfaces which come in contact with each other, are to be properly coated with good paint, or other suitable composition.

CAULKING.

Section 35. 1. It is indispensable that the caulking should be well executed, and no material used but the best brown oakum, with tarred spun yarn for the inner thread of bottom. The Surveyors require to see the caulking thoroughly tested with a beetle and horse, especially in new vessels, and at all surveys when the sheathing is stripped off the bottom.

2. In vessels with two thicknesses of planking, the condition of the caulking of the outside thickness is to be ascertained, in new vessels, by having a few pieces cut out from the bottom planking so as to expose the oakum; but it will not be necessary to have pieces cut out in vessels with single bottoms, as it can be ascertained whether the oakum is properly driven into the seams by inserting a thin knife into them from within the vessel.

KNIGHTHEADS, HAWSE TIMBERS, UPPER-DECK WATERWAYS, AND PLANKSHEER.

Section 36. 1. Where the knightheads, hawse timbers, upper-deck waterways, and plank-sheer are of wood, they must be of materials according to class in Table I, and fastened with bolts as in Table K.

2. The knightheads and hawse timbers are to be of sufficient siding and moulding, and to have boxing either outside or inside above the upper deck; they are to extend high enough for the efficient security of the bowsprit, and sufficiently below the upper deck to insure strength; to be well bolted, and connected by substantial hooks.

WATERWAYS.

3. Where the roughtree stanchions are of wood, the depth and moulding of the upper deck waterway must be sufficient to give them support; but the depth of the waterway is in no case to be less than three times the thickness of the upper deck, excepting where the planksheer covers it, and it will be required to be well bolted through the sheerstrakes or spirketting plate and upper deck stringer plate.

DECKS.

Section 37. 1. The flat of all decks to be of good quality, properly seasoned, free from sap and objectionable knots, the thickness and fastenings as per Table H.

DECK BOLTS.

2. The upper deck plank to be fastened by screw bolts from the upper side with nuts at the under side of the angle iron of the beams, and to the tie-plates (*see* Section 29). The bolts must be properly sunk with oakum and white lead under their heads, and be carefully covered over with turned dowels, with the fibre in the same direction as the deck plank, bedded in white lead, marine glue, or other suitable composition.

3. When the deck planks are six inches in width and under, single fastening will be sufficient; but, when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts.

4. If the deck is of teak, it may be one-eighth less in thickness than prescribed in Table H.

5. Upper decks must be renewed when worn in thickness as follows:—When a deck originally 4 inches thick is worn to 3 inches; $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches; 3 inches to $2\frac{1}{2}$ inches.

CEILING.

Section 38. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed, and from the upper part of the bilges upwards, either close ceiling or batten and space may be adopted, but the latter is considered preferable. It is recommended that the ceiling on the floors should be made in hatches, where practicable, of convenient sizes so as to be lifted when required for the purpose of survey, or for cleaning and painting. The thickness of the ceiling in the hold from the main keelson to the upper part of the bilges to be in accordance with Table H, and one-third less in thickness from thence upwards.

RUDDER.

Section 39. 1. The main piece of rudder to be of timber, according to class in Table I, of dimensions as per Table H, and the pintles as per Table K. In screw steamers, the size of the main piece of rudder must be increased in diameter not less than one-eighth above the dimensions given in Table H, and the pintles and braces in the same proportion.

RUDDER BRACES.

2. The lower rudder brace is to extend on the bottom planking sufficiently to receive not less than three bolts before the hood ends in addition to the bolts in the sternposts; the remaining braces will not be required to pass the hood ends, but the ends of their arms should be made \rightarrow shaped, or of other suitable form, so as to receive three through bolts in the sternpost.

CHAIN PLATE AND PREVENTER BOLTS.

Section 40. The chain plate and preventer bolts to be of the sizes given in Table K. When the chain and preventer plates are fitted on wood topsides, and the chain and preventer bolts are arranged to pass through below the iron sheerstrake, a plate is to be riveted to the frames, before working the wood topsides, of the same thickness as the sheerstrake, sufficiently wide to take the said bolts, and fillings of wood may be introduced between the frames for the bolts to pass through and be clenched upon plates, or otherwise secured to the satisfaction of the Surveyors.

CEMENT.

Section 41. All vessels to be efficiently cemented in the bottom, to the upper part of the bilges care to be taken to have proper water courses above the cement all fore and aft.

Section 42. 1. The Surveyors in their reports of vessels for original classification, which have partial deficiencies in either the workmanship, materials, or construction, are to state the same for the consideration of the Committee, when such vessels will be liable to have a reduced number of years assigned to them than they would otherwise have been entitled to.

2. *The Surveyors in submitting their reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.*

3. *Builders wishing to adopt plans other than those described herein, are to submit them in the usual manner through the Resident Surveyors (who are to state their opinions thereon) for the Committee's consideration and approval.*

PERIODICAL SURVEYS DURING CLASSIFICATION.

* **PERIODICAL SURVEYS.** (See N.B. at foot.)

Section 43. 1. All vessels to be surveyed annually if practicable; and whenever the copper, yellow metal, wood, or other sheathing, is stripped off, the condition of the planking, fastenings, and caulking to be ascertained.

2. Vessels marked C.F. to be subject to a Special Survey every four years; and those marked G.I.B.

* In the cases of Steam Vessels, see Section 24, for Survey of Engines and Boilers.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from ships losing their Characters from want of Survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

and I.B., to be subject to a Special Survey every *three* years. Such Special Surveys will be noted in the Register Book.

3. When these Special Surveys are held, the vessel to be placed on blocks of a proper height in a dry dock, or upon ways; if she is sheathed with wood, a sufficient quantity must be removed for the examination of the bolts, caulking and planking.

4. At the first Special Survey the limber boards, and ceiling equal to one strake fore and aft on both sides in the hold, below the upper turn of bilge, must be removed.

5. At subsequent Special Surveys, ceiling equal to an additional strake on both sides in the hold, and one strake on both sides in the 'tween decks (provided it is close ceiled), must be removed; portions of the cement to be cut out to ascertain its condition, and that of the frames and keel plate; bolts of the bottom and keel, if of iron to be got out for examination,—the number removed, and their condition, to be stated in the Report of Survey. If the frames, floors, &c., are found to be much oxidized, the whole of the ceiling to be removed and the oxidation cut or beaten off, and the iron work, if necessary, renewed, and the whole then to be properly coated or painted.

6. At the second Special Survey the windlass to be unhung where necessary, and its wood lining sufficiently stripped for examination, and the chain cables ranged for inspection.

VESSELS NOT SURVEYED WHILE BUILDING.

Section 44. 1. Vessels built in Great Britain, or the British North American Colonies, which have not been surveyed while building, will lose one year of the period to which they might otherwise have been entitled.

2. When a character is claimed for such a vessel, she must be placed on high blocks in a dry dock, or on a slip, or other convenient place, so that the keel and bottom may be seen and properly examined. The hold must be cleared, and proper stages made, the outside planking scraped bright from the light water-mark to the waterway seam, a sufficient number of fastenings removed from the keel, the planking of the flat of bottom, the bilges, between the light and load-line, and from the topsides, in order that their condition may be thoroughly ascertained.

3. Should the vessel be less than four years old from the date of launching, if close ceiled, a quantity of ceiling equal to one strake fore and aft on each side in the 'tween decks, a like quantity at the upper turn of bilge, and one plank at the lower turn of the bilge on each side over the floors in midships, will be required to be removed, and the limber boards lifted; but should the vessel exceed four years of age, unless she be found in a very clean and satisfactory condition, the whole of the ceiling, or such portion as the Surveyors may require, must be removed, excepting in the case of "batten and space ceiling."

WOODEN FLOORS, &c.

4. Should the vessel, however, have been constructed with wooden floors, or with iron and wooden frames, and with through fastenings, passing through the ceiling, and she be under four years of age, it will be sufficient if, in lieu of removing the ceiling as above described, a listing be cut out fore and aft on both sides in the 'tween decks 4 inches wide, a ceiling plank at the upper turn of the bilge and at the lower turn of bilge on each side over the floors to be taken out, and the limber boards lifted; but if she exceed four years of age, in addition to the above, a 4-inch listing must be extended fore and aft at the turn of the bilge on each side; and at other parts if considered necessary by the Surveyors.

5. When the foregoing preparations have been made, a careful survey must be held by two Surveyors (one of them to be an exclusive officer of the Society), who shall submit a report and midship section containing a full description of the vessel, comparing the same with the Rules.

6. Should a vessel submitted for classification be sheathed with wood or metal, the same will not be required to be stripped off (if all be found satisfactory to the Surveyors) beyond a sufficient quantity at the keel, hood ends, bilges, and between the light and load water-lines, for the purpose of ascertaining the condition of the caulking and the fastenings.

CONTINUATION OF SHIPS ON THE A CHARACTER.*

Section 45. 1. If, on the expiration of the term of years originally assigned, or at any age of a vessel, the owner be desirous to have his ship remain or be replaced on the letter A, such continuation will be granted for a period not exceeding two-thirds the number of years assigned originally, provided that a Special Survey as hereafter described be held by two Surveyors, one of them to be an exclusive officer of the Society, and that all repairs found necessary be completed to their satisfaction. The number of years assigned on continuation to commence from the date of the completion of such repairs.

2. The ship must be placed in dry dock or laid on blocks upon ways, so that the keel and bottom may be examined.

3. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.*

4. The hold to be cleared, and proper stages made both inside and outside.

5. All the outside planking from the light water-mark upwards, including planksheers and waterways, to be scraped or dubbed bright.

6. All the close ceiling, where the frames and floors are of iron, to be removed from the upper part of the bilges downwards, and, where close ceiling is fitted above this height, two strakes of ceiling are in addition to be removed between decks, and two strakes in the hold all fore and aft, when, should the condition of the frames and planking render it, in the opinion of the Surveyors, necessary, the whole of the close ceiling is to be removed.

7. The planking of one strake extending from amidships forward on one side, and from amidships aft on the other side, to be removed to expose the bilge plate, diagonal plates, and the backs of the frames, and when the iron sheerstrake is covered with planking an additional plank is to be removed in way of the same.

8. Not less than twelve bolts on each side, whether of iron or yellow metal, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship; also cement to be removed in places, for the purpose of ascertaining the condition of the floors, frames, iron keel-plate, butt straps to outside planking, &c.

9. Where the middle line bolts are of iron, their condition is to be ascertained; but, if this be not practicable, additional intermediate bolts of copper or yellow metal must be driven through and clenched.

10. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

11. The cables to be ranged, and the anchors and general equipment examined. The coal bunkers in steamers to be cleared, and all iron-work to be scraped clean.

* Where composite vessels are not constructed in accordance with the Committee's printed suggestions, and a deviation is required from a strict compliance with the Rules, special application must be made to the Committee.

COMPOSITE SHIPS.—TABLE OF MINIMUM DIMENSIONS OF FRAMES, PLANKING, KEELS, KEELSONS, STEMS, STERN POSTS, FLOOR PLATES, BEAMS, STRINGERS, &c.
 All plates, and all beam and angle iron, used in ships intended for classification, are to be stamped legibly in two places with the manufacturer's trade mark, or his name and the place where made.

Tonnage. <i>See Notes to Table.</i>	Distance of Frames from Moulding Edge to Moulding Edge all Fore and Aft.	Siding of Keel, Stem, and Stern Post, and Moulding of Stem.	Moulding of Stern Post and Keel.	Breadth and Thickness of Keel Plate, Flat Plate Keelson, and Thickness of Single Plate Vertical Keelson, standing upon Floors.		Dimensions of Angle Iron for Frames, and the Lower Angle Irons of Box Keelsons.	Dimensions of Angle Iron for Reversed Frames, and the Top Angle Irons of Box Keelsons.	Thickness of Centre Plate Keelson, Sheerstrake, (where not planked over) also of Butt Plates for Planking in Midships.	Thickness of Floor Plates, Hooks, Crutches, Side Inter-costal, and Box Keelson.	Thickness of Stringer Plates upon Beam Ends, Tie Plates on Beams, Sheerstrake (where planked over) and Topside Plating (where not planked over) Bilge Strake and Diagonal Plates on Frames, and Middle Line Inter-costal Keelsons.	Dimensions of Angle Iron on Beam Stringers, Stringers in Hold, and Keelsons.	Diameter of Solid Pillars to Beams.		Thickness of Outside Plank.		Thickness of Upper Deck, and Planksheer.	Thickness of Wood Ceiling in Hold to upper part of Bilges.	Windlass. <i>See Notes to Table.</i>		Main Piece of Rudder, from Lower Part of Counter upwards, Pall Bitt, and Wood Keelson, Sided and Moulded.	Tonnage. <i>See Notes to Table.</i>
				Breadth.	Thickness.							Hold.	Deck.	From the Garboard Strake up to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.	Topsides from the Planksheer to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.			Diameter of Iron Spindle.	Diameter of Main Piece.		
Tons. 50 and under 100	inches. 18	inches. 9½	inches. 11	inches. 19	inches. ⅝	inches. 2¼ × 2¼ × ⅝	inches. 2¼ × 2¼ × ⅝	inches. ⅞	inches. ⅝	inches. ⅝	inches. 3 × 3 × ⅝	inches. —	inches. 2	inches. 4	inches. 2½	inches. 2¾	inches. 1½	inches. 2¼	inches. 12½	inches. 9½	Tons. 50 and under 100
100 and under 200	18	10½	12	21	⅞	2¼ × 2¼ × ⅞	2¼ × 2¼ × ⅞	⅞	⅝	⅞	3 × 3 × ⅞	2½	2¼	4	3	3	1½	2½	14	11	100 and under 200
200 and under 300	18	11½	13	23	1	3 × 3 × ⅞	2¼ × 2¼ × ⅞	⅞	⅞	⅞	3 × 3 × ⅞	2¾	2¾	4½	3½	3¼	1¾	2¾	15	12	200 and under 300
300 and under 400	18	12½	14	25	1	3 × 3 × ⅞	2½ × 2½ × ⅞	⅞	⅞	⅞	3 × 3½ × ⅞	2⅞	2¾	4½	3½	3½	2	3	16	13	300 and under 400
400 and under 500	18	13	14½	26	1⅛	3¼ × 3½ × ⅞	2½ × 2½ × ⅞	⅞	⅞	⅞	3 × 4 × ⅞	3	2½	5	4	3½	2¼	3¼	17	14	400 and under 500
500 and under 600	18	13½	15	27	1⅛	3¼ × 3½ × ⅞	2½ × 3 × ⅞	1	⅞	⅞	3½ × 4 × ⅞	3⅛	2½	5	4	3¾	2½	3½	18	14¾	500 and under 600
600 and under 700	18	14	15½	28	1⅜	3½ × 4 × ⅞	2¾ × 3 × ⅞	1	⅞	⅞	3½ × 4½ × ⅞	3¼	2½	5½	4½	3¾	2½	3⅝	19	15½	600 and under 700
700 and under 800	18	14½	16	29	1⅜	3½ × 4 × ⅞	3 × 3 × ⅞	1⅛	⅞	1	4 × 4½ × ⅞	3⅜	2½	5½	4½	4	2¾	3¾	20	16	700 and under 800
800 and under 900	18	15	16½	30	1⅜	3¾ × 4½ × ⅞	3 × 3 × ⅞	1⅛	⅞	1	4 × 5 × ⅞	3½	2½	6	4¾	4	2¾	4	21	16¼	800 and under 900
900 and under 1000	18	15½	17	31	1⅜	3¾ × 4½ × ⅞	3 × 3¼ × ⅞	1⅜	1	1	4 × 5 × ⅞	3½	2⅝	6	4¾	4	2¾	4¼	22	16½	900 and under 1000
1000 and under 1200	18	16	17½	32	1⅜	3¾ × 4¾ × ⅞	3 × 3½ × ⅞	1⅜	1	1	4½ × 5 × ⅞	3½	2⅝	6¼	5	4	3	4½	23	16¾	1000 and under 1200
1200 and under 1500	18	16½	18	33	1⅜	3¾ × 4¾ × ⅞	3½ × 3½ × ⅞	1⅜	1	1	4½ × 5½ × ⅞	3⅝	2⅝	6¼	5	4	3	4⅝	24	17	1200 and under 1500
1500 and under 2000	18	17	18½	34	1⅝	4 × 5 × ⅞	3½ × 4 × ⅞	1⅜	1	1	5 × 6 × ⅞	3¾	2¾	6½	5¼	4	3	4⅝	25½	17½	1500 and under 2000
2000 and under 2500	18	17¼	19	34½	1⅝	4 × 5½ × ⅞	3½ × 4½ × ⅞	1⅜	1	1	5½ × 6½ × ⅞	3¾	2¾	7	5¾	4	3	4¾	27	18	2000 and under 2500
2500 and under 3000	18	17¼	19½	34½	1⅝	4 × 6 × ⅞	3½ × 4½ × ⅞	1⅜	1	1	5½ × 6½ × ⅞	3¾	2¾	7½	6	4	3	4¾	28½	19	2500 and under 3000
3000 and under 3500	18	17½	19½	35	1⅞	4 × 6½ × ⅞	3½ × 4½ × ⅞	1⅝	1	1	5½ × 6½ × ⅞	3¾	2¾	8	6	4	3	5	30	20	3000 and under 3500

MEM.—The scantlings given in the above Table are intended for Ships the length of which, measured from the forepart of the Stem to the after part of the Stern-post on the range of the Upper Deck, does not exceed seven times their moulded breadth or ten times their depth of Hold, taken from the upper part of Floors to the top of the Upper Deck Beams. For Ships which exceed these proportions, the plans to be submitted for the Committee's consideration. The depth for defining the proportions of spar decked vessels, is to be measured from the top of the floor plates to the upper side of the middle or tonnage deck beams.

RIVETS. Diameter of Rivets required for Thickness of Plates - - -	5 8 of an Inch.		3 4 of an Inch.			7 8 of an Inch.				1 Inch.			Diameter of Nut and Screw Bolts for Fastening Flat of Deck. 3 ins. and under 3½ ins. - - ½ inch 3½ " " 4 " - - ⅞ " " 4 inches - - - - - 1 " "	
	5 16	6 16	7 16	8 16	9 16	10 16	11 16	12 16	13 16	14 16	15 16	16 16		

NOTES TO TABLE H.

TONNAGE.—In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels, is to regulate all the scantlings of the hull, and also the equipment of the vessel. In vessels having a raised quarter deck, or a poop, or top-gallant forecastle, or deck houses, or awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, with the addition of the tonnage of the space required for propelling power, is to regulate the equipment, and also the size of the main piece of rudder and windlass, and the keel and keelsons and their number, and the scantling of the stringer plates on the upper and lower deck beams, and the requirements as to double rivetting. But in vessels where the tonnage of the erections above the tonnage deck is less than that required for crew space, then the difference between the tonnage of these erections and the tonnage of the space allowed for crew is to be added to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment and the size of the main piece of rudder and windlass, and the keel and keelsons and their number, the scantling of the stringer plates on the upper and lower deck beams, and the requirements for double rivetting.

WOOD KEEL, Stem, and Stern Post to be of the dimensions specified in Table.

KEEL PLATE.—The keel plate to be of the breadth and thickness prescribed in Table H, to be made continuous up the apron and up the inner stern-post as high as practicable, but in all cases to extend above the lower deck or hold beam stringer angle iron. Forward and aft the plate is to be curved to the form of the bearding line, and to be one-sixteenth of an inch thicker than prescribed in the Table, where it passes over the deadwoods, apron, and inner stern-post, and to be sided as required by the form of the vessel, to have an angle iron of the size given in Table for stringer angle irons rivetted on each edge, flanged to the form of the vessel to receive the plank fastenings. The keel plate to maintain its breadth for three-fifths the length of the keel in midships, and then to be gradually reduced until its edges conform with the flange of the angle iron on the keel plate forward and aft; the butts of the keel plates to be shifted clear of the keel scarphs.

FRAMES.—The frames to be of the dimensions as set forth in Table, and the narrow flange to be of a parallel thickness, that the nuts of the screw bolts may fit closely. The frames to be in as long lengths as possible, fitted and rivetted on to the keel plate, and extended as near to the middle line as practicable, according to the plan of construction adopted, and in all cases to extend to the gunwale, and where raised quarter decks, poops, forecastles and spar decks are constructed, to their deck stringers respectively, except when constructed with a rounded form at the gunwale, then they may terminate at the lower part of the curve; if the frames be welded, the welds to be perfect with not less than four feet shifts from the welds of next frames, or if butted to have not less than four feet shifts with four feet lengths of angle iron of the same size as the frame, fitted back to back rivetted to them, and secured to the outside planking. The spacing of the frames (where one thickness of planking in the bottom is intended) not to exceed 18 inches from moulding edge to moulding edge all fore and aft, a four feet length of angle iron, the size of the frame, is to be rivetted to each floor and to the keel plate, back to back with the frames.

FLOOR PLATES.—The floor plates to be in thickness according to Table, but at each end of the vessel for one quarter of her length they may be reduced in thickness one-sixteenth of an inch where the midship floor plates are six-sixteenths and under ten-sixteenths of an inch, and two-sixteenths of an inch where the plates are ten-sixteenths and above in thickness. The floor plates to be in depth at middle line according to the following rule, viz., to the vessel's depth, measured from the top of the keel to the top of the upper or spar-decked beams amidships add the extreme breadth of the vessel, two-fifths of that sum in inches to be the depth of the floor plates at the middle line well fore and aft, but at the extreme fore and after ends, they must be deeper, so as to form an efficient connection between the two sides of the vessel. The floor plates are to extend up the bilges not less than to a perpendicular height of twice and a half the depth of floors amidships, from upper side of keel at middle line; and in no case to be less moulded in any part, than a fair taper between the depth at middle line, and the moulding at their extreme ends, which is to be not less than the moulding of the frames. The ends of the floors to maintain the height prescribed amidships, for one quarter of the vessel's length, they may then be gradually lowered forward and aft until the upper edges of the floor plates are level, which place is to be determined by the form of the vessel, and from that point to the vessel's ends they are to be gradually increased in depth, so as to efficiently connect the sides of the vessel; the upper parts of the floors forward and aft are to be high enough to give ample room between the reverse frames on each side of the vessel, for fitting the keelson angle irons. In vessels having considerable rise of floor, the depth of the floor plates, on a square, at the quarter of the vessel's extreme moulded breadth, set out from the middle line, is to be not less than three-fifths the depth of the floor plate, at the middle line, and the floor plate is to be extended up the bilges, by a fair taper from middle line, until it terminates at the moulding of the frames. A floor plate to be fitted and rivetted to every frame, and to be extended across the middle line; but where a vertical centre plate is adopted at middle line, then the floor plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames. When floors extend from side to side and are made in two lengths, the butts are to have double butt straps, one on each side of the floor plates, and three-fourths the thickness of the floor plates, or else the floor plates must be lapped and treble rivetted.

WATERCOURSES.—Watercourses are to be formed through all the floor plates, on each side of the middle line and at the bilges above the frames, so as to allow water to reach the pumps freely, and also through the vertical centre plate, and intercostal keelsons when such keelsons are adopted.

REVERSED FRAMES.—Reversed angle irons on frames to be in size as per Table. All vessels under 200 tons to have reversed angle-iron rivetted to every frame and floor plate, across the middle line, extended to the height of the upper part of the bilge, and to the gunwale on alternate frames, and to have double reversed angle irons in way of all keelsons and stringers in hold; and in addition, all vessels of 200 tons and upwards, to have reversed angle-iron extended to the upper deck beam stringer on alternate frames, and where raised quarter decks and spar-decks are constructed, to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; and on the remaining frames reversed angle-irons are to be fitted to above the height of the lower deck or hold beam stringer angle-iron, if the vessel has two decks or tiers of beams, and to above the height of the middle deck beam stringer angle-iron, if the vessel has three decks or tiers of beams, and to above the height of the middle and floor plates to be in diameter as specified in Table, and be spaced not to exceed a distance of nine times their own diameter from centre to centre; butts of reversed angle-iron to be secured with butt straps.

BEAMS.—Beams to be of bulb plate, with double angle-irons on the top edge, or of T bulb iron, or of any other approved form of equal strength. The upper deck beams to be one quarter of an inch in depth to every foot in length of the midship beam, and to be in thickness one-sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added; if of T bulb the united breadth of the top flanges to be not less than three-fourths the depth of the beam, and where beams are formed of bulb plate with double angle-irons on the top edge, the flanges of each of the angle-irons are not to be less in their united breadth than three-fourths the depth of the beam, and to be one-sixteenth of an inch in thickness for every inch of the two sides of the angle-iron. Middle deck, hold, and orlop beams, to be one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams. All beams to be efficiently connected with the frames by bracket ends, or knee plates, the arms of each to be not less than twice-and-a-half the depth of the beams in length, and of not less thickness than the beams. All beams for at least three-quarters the length of the vessel in midships, and in addition the beams under the bowsprit, pall bit, windlass and capstan are to be pillared; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper deck, or spar-deck, and to be of the sizes given in Table.

IRON SHEERSTRAKE.—The iron sheerstrake to be one inch in breadth for every six feet of the vessel's length, for half her length in midships, and to be of the thickness given in Table; it may then be gradually reduced in breadth and in thickness to three-fourths of the midship breadth and thickness at her ends. The butts of the iron sheerstrake in all cases to be shifted clear of the butts of the stringer plates on the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates where practicable to be not less than nine feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadths, but carved plated and single rivetted; butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrake to be fitted less than two-thirds of the breadth required by the Rule for sheerstrake below the upper deck stringer plate. The butt straps in all cases to be in one piece, whether fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. See Section 30.

IRON BILGE STRAKE.—The bilge strake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in midships, and from thence to the ends of the vessel they are to be reduced gradually to one-half their midship breadth; the thickness of the plates to be as prescribed in Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for floorheads, such position for the bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be extended to the ends of the vessel in accordance with her form, and properly rivetted to the frame.

DIAGONAL PLATES ON FRAMES.—The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and fitted in pairs, transversely, all fore and aft, at an angle of 45°, with the butts of each pair meeting between the frames; to be of the thickness given in Table, and connected to the sheer and bilge strake plates by butt straps double rivetted, and to be efficiently rivetted to each other, and to each frame they cross.

STRINGER PLATES.—All vessels to have stringer plates of the thickness given in Table upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three decked vessels to be in width one inch for every seven feet of the vessel's entire length for half her length in midships, and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width in midships; in no case however is the width in midships to be less than eighteen inches. The stringer plates are to be rivetted to the beams and properly shifted, fitted home, and rivetted to the iron sheerstrake, with an angle iron of the dimensions given in Table, and the roughtree stanchions are not to pass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to three-fourths the midship breadth of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the dimensions given in Table, extending all fore and aft, rivetted to reverse angle iron on each frame and to the stringer plates. In cases where a deck is not laid, and the width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such reduction be fully compensated for. All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron or plate iron not less than two feet long, fitted in the throat of them, properly rivetted to each flange, and the thickness of the connecting plates not to be less than the angle iron they cover. Upper deck gutter waterways are to be flooded to ascertain if there be any leakage, and when completed they are to be properly cemented.

TIE PLATES.—All vessels are to have tie plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition thereto the beams of the upper and middle decks in three decked or spar decked vessels, and of the upper deck in vessels of one or two decks must have tie plates fitted from side to side diagonally, in number one pair for about every 35 feet of the vessel's length; these plates in both cases must not be less in width than once and a half the depth of the beams of their respective decks, and of the thickness required for stringer plates; they are to be well rivetted to each other and to the beams and stringers, and to have intermediate fastenings into the deck plank between the beams, in all cases their butts to be chain rivetted. Upon hold beams where a deck is not to be laid, a tie formed of double angle irons of the size given for the main frames of the ship may be fitted each side of the hatchways in lieu of tie plates, but if the beams are made of such additional strength laterally as not to require the support given by the said angle irons or tie plates, double angle irons of the above size fitted at the centre line, from opening to opening, may be substituted. All hatchways and mast holes are to be properly framed to receive half beams where required, and the latter to have mast partners at each tier of beams (except at orlop beams), the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than three times the diameter of the masts; these plates to be well rivetted to each other, and to the beams, and angle iron carlings, and at the decks where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and rivetted to the plate round the mast hole. The mast holes, skylights, and companions must be properly secured to the satisfaction of the Surveyors. Where wood comings are fitted, plates are to be rivetted to the beams to which the deck ends are to be fastened.

BUTT STRAPS.—Butt straps in all cases, except those of floor plates (see Section 13) to be one-sixteenth of an inch thicker than the plates they connect, and to be fitted with the fibre of the iron in the same direction as that of the plates, and rivetted as per Section 4.

BUTT PLATES OF OUTSIDE PLANKING.—The plates to which the butts of the outside planking are to be secured, must be of the breadth of the planks, and extend from frame to frame, efficiently rivetted thereto, and of the thickness given in Table, but on the bows and quarters or wherever else the plank ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed.

RIVETS AND RIVETTING.—The rivets to be of the best quality, and to be of the diameter as per Table, the rivet holes to be regularly and equally spaced, and carefully punched opposite each other in the adjoining parts, from the faying surfaces in the laps, lining pieces, butt straps, and frames, and to be countersunk where required, the rivets not to be nearer to the butts or edges of the plating, lining pieces to butts, or of any angle iron, than a space equal to their own diameter, and not to be further apart from centre to centre than five times their diameter, or nearer than four times their diameter from centre to centre, and to be spaced through the frames and outside plating, and in reversed angle iron a distance equal to nine times their diameter from centre to centre. All butts of iron plating, excepting those of poops and top-gallant forecastles, to be at least double rivetted, and a space equal to twice the diameter of the rivets to be between each row; where treble rivetting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

GARBOARD STRAKES.—The garboard strakes not to be less than two-thirds the depth of the keel prescribed in Table, and properly rabbetted into it, to be fitted closely to the iron keel plate, and to be of sufficient width. The butts of the garboard strakes to have not less than four feet six inches shift from the butts of the garboard strake on the opposite side of the vessel, nor less than the same shift clear of the keel scarph. For bolting, see Section 33.

PLANKING.—The planking to be thoroughly seasoned, quite free from sap, wane, or other defects, to be wrought with the heart side to the frames, and with not less than three strakes between the butts, without step butting, and with not less than six feet shifts; the garboard strakes to be shifted and of the thickness given in Section 7; the bottom planking is not to be less in thickness than prescribed in Table, from the garboard strakes up to within a fifth of the depth of hold set down below the upper deck stringer plate, from thence to the plank-sheer to be in thickness as prescribed in Table for topsides; or, if preferred, the bottom planking may retain its thickness up to within a fourth of the depth of the hold set down below the upper deck stringer plate, and from thence to the plank-sheer be gradually diminished in thickness to that prescribed in Table for topsides; the thickness of the wood sheerstrakes may be the thickness of the iron sheerstrake they cover less than that prescribed by Table. Outside planks (except the garboard strakes) are not to be more than twelve inches broad; they are to be fitted quite close to the frames and plates, and to each other at their inner edges, and wrought with proper seams outside in proportion to their thickness; the hood-ends may be reduced one-fifth from the thickness given in Table, at the stem or stern-post, and one-third at the buttock. The caulking edge of the keel seam, and hood-end seams of the planking at the stem and stern-post, need not exceed from two and a half inches to four inches, in proportion to the tonnage of the vessel; which can be arranged by trimming the back rabbet from the bearding line as required, so as not to unnecessarily reduce the keel, stem, and stern-post. Furrers or pads are in no case to be used.

DECKS.—The flat of all decks to be of good quality, properly seasoned, free from sap and objectionable knots, the thickness and fastenings as per Table. The upper deck plank to be fastened by screw bolts from the upper side with nuts at the under side of the angle irons of the beams and to the tie plates, see Section 29. The bolts must be properly sunk, with oakum and white lead under their heads, and be carefully covered over with turned dowels, their fibre in the same direction as the deck plank, and bedded in white lead, marine glue, or other suitable composition. When the deck planks are six inches in width and under, single fastening will be sufficient; but when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts. If the deck is of Teak it may be one-eighth less in thickness than prescribed in the Table. Upper decks must be renewed when worn in thickness as follows, viz.:—When a deck originally 4 inches thick is worn to 3 inches; 3½ inches to 2½ inches; 3 inches to 2½ inches.

CEMENT.—All vessels to be efficiently cemented in the bottom to the upper part of the bilges, care to be taken to have proper water courses above the cement all fore and aft.

WINDLASS.—The diameter of main piece of windlasses in Steam Ships may be seven-eighths of that required in the Table, provided always the body of the windlass be not of unusual length.

TABLE I.

EXHIBITING THE NUMBER OF YEARS TO BE ASSIGNED TO THE DIFFERENT DESCRIPTIONS OF TIMBER USED IN

COMPOSITE SHIPS,*The same to be of good quality, properly seasoned, and free from defects.*

	TIMBER.	KEEL.	Stem, Sternpost, Apron, Inner Stern- post, Deadwood, Knightheads and Hawse Tim- bers.	Floors, Wood Frames and Ceiling upon them; Beams and Keelsons.	OUTSIDE PLANK.		Upper Deck Waterway, Spirketting, Planksheer, and Roughtree Timbers.	RUDDER, WINDLASS, and PALLBITT — Main Pieces.
					From Top of Keel to Two-fifths the Depth of Hold (a)	From Two-fifths the Depth of Hold (a) to Gunwale.		
1	East India Teak	16	16	16	16	16	16	16
2	Greenheart, Morra, Iron Bark	14	12	12	14	12	12	14
3	(b) Live Oak, English, African, French, Adriatic, Italian, Spanish, and Portuguese Oaks	14	12	12	12	12	12	14
4	Pitch Pine, Oregon and Huon Pine, Larch, Hackmatack, Cowdie or Kaurie Pine ..	9	9	9	12	10	10	—
5	(b) Northern Continental Oak	12	9	9	12	10	10	9
6	(b) American White Oak	10	7	7	10	8	7	7
7	Dantzic, Memel, Riga, and American Red Pine	9	8	8	10	9	10	—
8	American Rock Elm	16	—	8	16	6	6	—
9	(c) English and French Elm, and Beech	16	—	—	16	—	—	—
10	Spruce Fir, Swedish and Norway Red Pine	—	—	—	8	8	—	—

(a) That is, two-fifths the depth of hold taken from the top of floors to the top of upper or tonnage deck beams, set up from the keel plate, in midships; which height is not to be exceeded fore and aft on a straight line.

(b) Live Oak, English, French, Adriatic, Italian, Spanish, and Portuguese Oak will be allowed to be used for stems, and for the bow and buttock planks where East India Teak would be liable to break in working, in vessels otherwise built of 16 years' timber material.

(b) Whenever any of the Oaks, or other woods of an acid nature are used, the best Hair Felt, Canvas, or other approved material, in addition to paint, is to be placed between them and the Iron Plates and Angle Irons.

(c) English and French Elm allowed for Garboard Strakes and Planking of flat of bottom in Ships of the 16 years' grade. Where parties are desirous of using Woods not inserted in the Table, special application to be made to the Committee.

TABLE K.
Exhibiting the Sizes of Bolts, and Pintles of Rudder, in Composite Ships.

Tonnage.	Deadwood Keel (b), Stem (a) and Stern Post Bolts.	Bottom Plank, Scarphs of Keel, and Thwartship Garboard, Bolts.	Topside, Watertway, and Planksheer Bolts.	Chain Plate Bolts.	Pintles of Rudder.	Tonnage.
50 and under 100	$\frac{7}{8}$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{1}{3}$	2	50 and under 100
100 and under 200	1	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{7}{8}$	$2\frac{1}{4}$	100 and under 200
200 and under 300	$1\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{6}$	1	$2\frac{1}{2}$	200 and under 300
300 and under 400	$1\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{6}$	$1\frac{1}{8}$	$2\frac{3}{4}$	300 and under 400
400 and under 500	$1\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{6}$	$1\frac{1}{8}$	3	400 and under 500
500 and under 600	$1\frac{1}{8}$	$\frac{1}{3}$	$\frac{1}{6}$	$1\frac{1}{8}$	$3\frac{1}{8}$	500 and under 600
600 and under 700	$1\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{6}$	$1\frac{1}{4}$	$3\frac{1}{4}$	600 and under 700
700 and under 800	$1\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{6}$	$1\frac{1}{4}$	$3\frac{1}{2}$	700 and under 800
800 and under 900	$1\frac{3}{8}$	$\frac{1}{6}$	$\frac{1}{6}$	$1\frac{1}{4}$	$3\frac{1}{2}$	800 and under 900
900 and under 1000	$1\frac{3}{8}$	$\frac{1}{6}$	$\frac{1}{6}$	$1\frac{3}{8}$	$3\frac{3}{8}$	900 and under 1000
1000 and under 1200	$1\frac{3}{4}$	1	$\frac{1}{4}$	$1\frac{3}{8}$	$3\frac{5}{8}$	1000 and under 1200
1200 and under 1500	$1\frac{5}{8}$	1	$\frac{1}{4}$	$1\frac{3}{8}$	$3\frac{3}{4}$	1200 and under 1500
1500 and under 2000	$1\frac{6}{8}$	$1\frac{1}{6}$	$\frac{1}{6}$	$1\frac{1}{2}$	$3\frac{7}{8}$	1500 and under 2000
2000 and under 2500	$1\frac{7}{8}$	$1\frac{2}{6}$	1	$1\frac{1}{2}$	4	2000 and under 2500
2500 and under 3000	$1\frac{8}{8}$	$1\frac{2}{6}$	1	$1\frac{5}{8}$	$4\frac{1}{8}$	2500 and under 3000
3000 and under 3500	$1\frac{8}{8}$	$1\frac{3}{6}$	$1\frac{1}{6}$	$1\frac{3}{4}$	$4\frac{1}{8}$	3000 and under 3500

The length of the keel scarphs to be five times the mean of the siding and moulding of the keel.

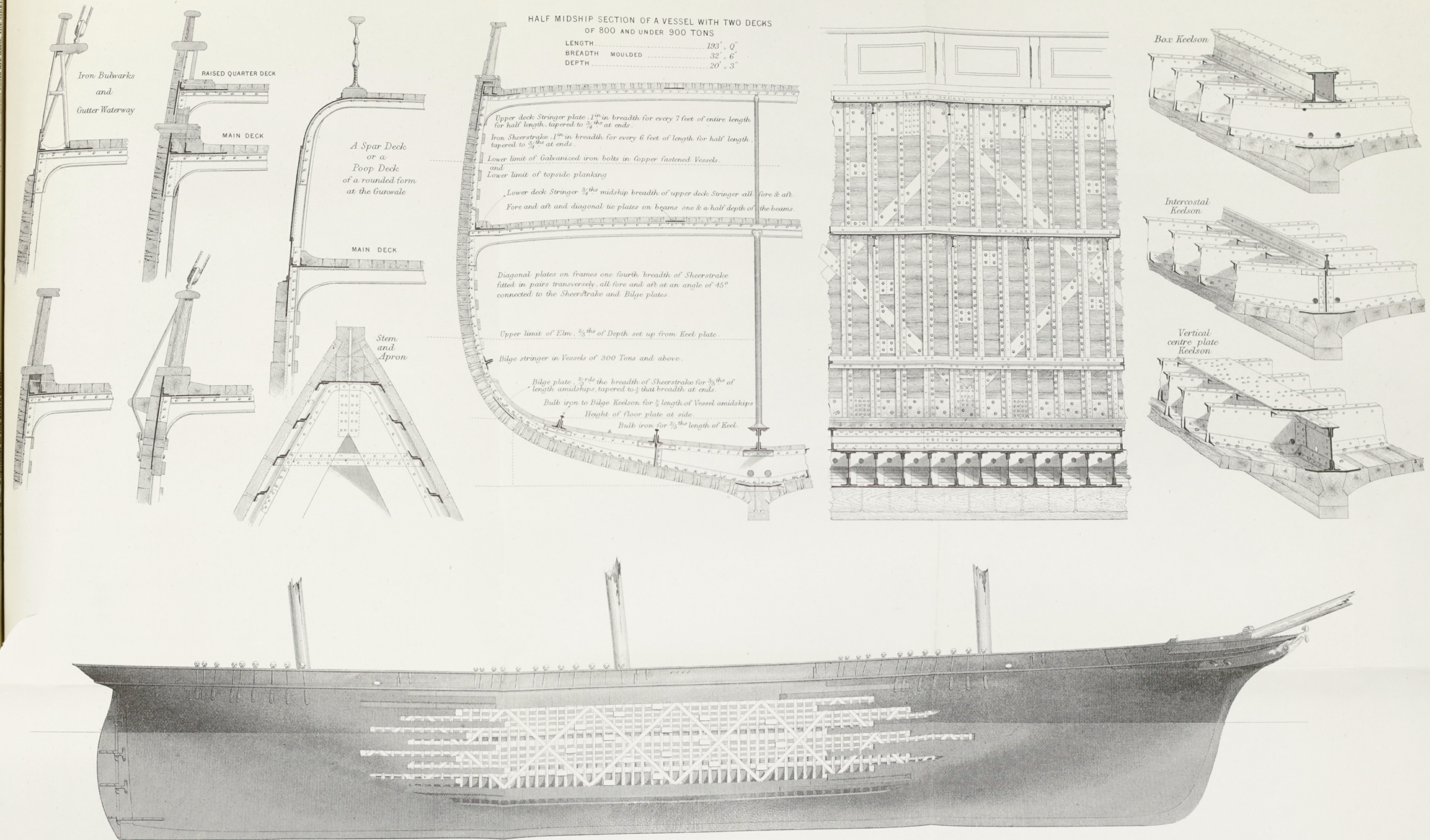
(a) Stem Scarphs are not to be less than seven-tenths the length of the Keel Scarphs, and all Scarphs are to be Tabled.

BOLTS. 33.—The bolts to be not less than the sizes given in Table, the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

(b) The wood keel to have a vertical bolt through the keel plate between each frame. The stem, stern-post, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel. The screw pointed bolts for fastening the planking when less than five inches thick to be of such form under the heads, as will prevent them from turning, their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness, the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred. All outside planks ten inches broad and above, to be double fastened; eight inches-and-a-half and under ten inches, double and single fastened alternately; and under eight inches-and-a-half single fastened; and all butts to be double fastened. The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one-fifth the depth of hold set down below the upper deck stringer plate are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the planksheer they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and covered after the seams of the bottom are all caulked) with turned well seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be covered with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used, the sinking of them

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.
ILLUSTRATIONS OF THE SUGGESTIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS

1868.



TO ENLIGHTENED THE CONSTRUCTION AND CLASSIFICATION

1964



12. *The annual and special periodical surveys to apply to vessels so continued as required by Section 43 for ships on original class.*

EQUIPMENT.

Section 46. 1. The tonnage, as per Section 32 of Rules for Wood Ships, is to regulate the equipment. (*See Sections 72 to 78 of the Rules for Wood Ships, also Table No. 22.*)

2. The boilers and machinery are to be considered as part of the equipment, and, unless the Surveyors are satisfied of their efficiency, the figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules.

DEFECTIVE EQUIPMENT.

3. In the case of a steam vessel already classed of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel in the Register Book, but where in the opinion of the Committee the machinery or boilers are deemed so far inefficient or defective as to imperil the vessel's safety, the figure 1 will be withheld, and a red ring inserted in place thereof; and in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the figure 1 for equipment; as described in the foot-note on the page of the Register Book, and in the Key thereto

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 47. 1. In vessels propelled by steam, the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them, in the manner and form, No. 8 annexed. The Committee will thereupon, if found satisfactory, grant a certificate, and insert in the Register Book the notification, "LMC." *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition. (*See Section 46.*)

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS.

2. On the different parts of the engines during erection.
3. On the sea connections while being fitted to the vessel.
4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c. while being fitted.

5. Testing the boilers by hydraulic pressure.
6. When engines and boilers are being fixed on board the vessel.
7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under special survey, the machinery and boilers must also be constructed under special survey.

9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠LMC.," or "✠NE.&B.," or "✠NB."

10. In order to facilitate this inspection, the plans of the machinery and boilers should be examined, and from them the working pressure fixed.

11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (See paragraph 43.)

14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

15. The boilers, together with the machinery, to be inspected at different stages of construction.

16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

17. Two safety valves to be fitted to each boiler and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lb. per square inch, the safety-valves may be loaded to 5lbs. above the working pressure. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case is to exceed 10 per cent. of the working pressure.

18. An improved safety valve is also to be fitted to the superheater.

19. In Winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

20. Each valve is to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles are to extend through the covers, and to be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop valves are to be fitted so that each boiler can be worked separately.

22. Each boiler is to be fitted with a separate steam gauge, to accurately indicate the pressure.

23. Each boiler is to be fitted with a blow-off cock independent of that communicating with the sea.

24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyors.

STEEL BOILERS.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*see* Circular, No. 438,* page 83):—

1. The material of stays and of plates not exceeding 1 inch in thickness is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82 degrees Fahrenheit.

2. Steel rivets are to be considered as part of the material, and, in addition to being subjected to a shearing test, they must be capable of withstanding the same test as the plates are required to undergo.
3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.
4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.
5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.
6. No steel stays are to be welded.
7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed pumps each capable of supplying the boilers; the pumps, &c., are to be so arranged that either can be overhauled whilst the other is at work.

27. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed pump and one bilge pump will be deemed sufficient, provided they are of adequate capacity.

29. A bilge injection or a bilge suction to the circulating pump is to be fitted.

30. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel. The mud boxes and roses in engine-room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water. This pump is to

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

be so fitted as to pump from each compartment, to deliver water on deck, and, if no hand pump is fitted in engine-room, it must be fitted to be worked by hand.

32. All steam and feed pipes are to be of copper, and of a thickness to the satisfaction of the Surveyor.

33. All discharge pipes are to be, if possible, carried above the deep load line, and to have discharge-valves fitted in an accessible position.

34. No pipes are to be carried through the bunkers without being properly protected.

35. Bilge suction pipes are to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough-turned and finished.

Cast steel shafts to be subjected to the following tests, viz. :—

A tensile test to be made to show that the material has not a greater tenacity than 30 tons per square inch, and a test piece to be cut from the casting which will permit of being bent cold through an angle of 90° over a radius not greater than $1\frac{1}{4}$ inches.

37. Gauges of an improved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, *see* the formula in paragraph 45.

COCKS, PIPES, AND SEA CONNECTIONS.

38. With a view to ensuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and in vessels having *new engines or boilers* :—

39. All sea-cocks are to be attached to Kingston valves of a height sufficient to lift them up to the level of platforms.

40. Cocks and valves connecting all suction pipes are to be fixed above the stoke-hold and engine-room platforms.

41. The arrangement of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement is to be reported to the Committee.

SPARE GEAR.

42. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting-rod top end bolts and nuts,
2 connecting-rod bottom end bolts and nuts,
2 main-bearing bolts,
1 set of coupling bolts,
1 set of feed and bilge pump valves,

1 set of piston springs (where common springs are used),
A quantity of assorted bolts and nuts,
Iron of various sizes.

43. In addition to the foregoing, the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft,	1 pair of cross-head brasses,
Propeller shaft,	1 set of link brasses,
Propeller, or a full set of blades,	1 cylinder escape valve and spring,
Stern-bush, or lignum-vitæ lining for bush,	1 eccentric strip complete,
Air pump rod,	6 junk ring bolts,
Circulating pump rod,	6 cylinder cover bolts,
H. P. valve spindle,	4 valve chest cover bolts,
L. P. valve spindle,	2 dozen boiler tubes,
1 set of check valves,	3 dozen condenser tubes,
1 pair of connecting rod brasses,	1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS.

44. The strength of circular shells to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where **C** = co-efficient as per following table.

T = thickness of plate in inches.

D = mean diameter of shell in inches.

B = percentage of strength of joint found as follows—the least percentage to be taken,

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$B = \frac{n \times a}{p \times T} \times 90$ with iron rivets in iron plates with drilled holes.

$B = \frac{n \times a}{p \times T} \times 85$ with steel rivets in steel plates.

$B = \frac{n \times a}{p \times T} \times 70$ with iron rivets in steel plates.

(In cases of rivets being in double shear, $1.75a$ is to be used instead of a .)

where p = pitch of rivets.

d = diameter of rivets.

a = sectional area of rivets.

n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$ -inch thick and under.	For Plates $\frac{3}{4}$ -thick and above $\frac{1}{2}$ -inch.	For Plates above $\frac{3}{4}$ -inch thick.
Lap Joint, Punched Holes.....	155	165	170
Lap Joint, Drilled Holes	170	180	190
Double Butt Strap Joint, Punched Holes	170	180	190
Double Butt Strap Joint, Drilled Holes .	180	190	200

STEEL BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{3}{8}$ -thick and under.	For Plates $\frac{9}{16}$ thick and above $\frac{3}{8}$.	For Plates $\frac{3}{4}$ -thick and above $\frac{9}{16}$.	For Plates above $\frac{3}{4}$ -thick.
Lap Joints	200	215	230	240
Double Butt Strap Joints	215	230	250	260

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the above tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise stiffened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the weakest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, and for all stays which are welded, 6,000 lb. per square inch; for unwelded stays above $1\frac{1}{2}$ inches effective diameter, 7,500 lb. per square inch.

Steel Stays.—For screw stays, and for other stays not exceeding $1\frac{1}{2}$ inches effective diameter, 8,000 lb. per square inch; for stays above $1\frac{1}{2}$ inches effective diameter, 9,000 lb. per square inch. No steel stays are to be welded.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch.}$$

where **T** = thickness of plate in sixteenths of an inch.

P = greatest pitch in inches.

C = 90 for plates $\frac{7}{16}$ thick and under fitted with screw stays with riveted heads.

C = 100 for plates above $\frac{7}{16}$ fitted with screw stays with riveted heads.

C = 110 for plates $\frac{7}{16}$ thick and under fitted with screw stays and nuts.

C = 120 for plates above $\frac{7}{16}$ fitted with screw stays and nuts.

C = 140 for plates fitted with stays with double nuts.

C = 160 for plates fitted with stays with double nuts, and washers at least $\frac{1}{2}$ thickness of plates and a diameter of $\frac{2}{3}$ of the pitch, riveted to the plates.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guided from the direct action of the heat.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^3 \times T}{(L-P) \times D \times L} = \text{working pressure in lbs. per square inch.}$$

where **L** = length of girder.

P = pitch of stays.

D = distance apart of girders.

d = depth of girder at centre.

T = thickness of girder at centre. All these dimensions to be taken in inches

C = $\begin{cases} 6,000, & \text{if there is one stay to each girder.} \\ 9,000, & \text{if there are two or three stays to each girder.} \\ 10,200, & \text{if there are four stays to each girder.} \end{cases}$

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89,600 \times T^2}{L \times D} = \text{working pressure in lb. per square inch.}$$

where 89,600 = constant.

T = thickness of plates in inches.

D = outside diameter of furnace in inches.

L = length of furnace in feet. If rings are fitted, the length between rings to be taken.

The pressure in no case to exceed $\frac{8,000 \times T}{D}$

The strength of the ribbed furnaces (with ribs 9 inches apart) and corrugated furnaces (corrugations $1\frac{1}{2}$ inches deep) to be calculated from the following formula :—

$$\frac{1,000 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch,}$$

where T = thickness of plates in sixteenths of an inch.

D = (for ribbed furnaces) outside diameter of plain part.

D = (for corrugated furnaces) greatest diameter of furnaces in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any case where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULE FOR DETERMINING SIZES OF SHAFTS.

45. The diameters of crank and straight shafts are to be not less than those given by the following formula :—

$$d = \sqrt[3]{\frac{P S D^2}{C}}$$

in which

d = Diameter of shaft in inches.

P = Absolute pressure in lbs. per sq. inch.

S = Stroke in inches.

D = Diameter of Low Pressure Cylinder in inches.

C = Constant according to the following table.

	For Crank and Propeller Shafts.	For Intermediate Shafting.
Double Expansion Engines ...	10,800	12,300
Triple Expansion Engines ...	18,800	21,200
Quadruple Expansion Engines	20,800	23,500

PERIODICAL SURVEYS OF MACHINERY, ENGINES AND BOILERS (*See N.B. at foot.*)

46. The machinery and boilers of all steam ships are to be surveyed annually if practicable, and, in addition are to be submitted to a Special Survey every four years.

47. At these Special Surveys the propeller, stern-bush, and fastenings of the sea connections are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyors, the stern shaft is to be drawn and examined at least once in four years, and more frequently if deemed necessary by the Surveyors.

48. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

49. The sea connections and arrangements of cocks, pipes, bilge suctions, roses, &c., are to be examined.

50. The boilers and superheaters are to be examined, internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

51. The safety valves are to be examined and set to the safe working pressure.

52. If satisfactory, these surveys will be recorded in the Register Book thus:—"L.MC.5,88" in red; or "B.&MS.5,88" in red.

53. "L.MC." (LLOYD'S MACHINERY CERTIFICATE) with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

54. "B.&MS." (BOILERS and MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

55. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from ships losing their Characters from want of Survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

BOILERS.

56. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

57. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

58. The safety valves are to be examined and set to the safe working pressure.

59. If satisfactory, these surveys will be recorded in the Register Book thus: "B.S.5,88" *in red*.

60. "B.S." (BOILERS SURVEYED), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

61. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

62. The boilers and machinery are to be considered as part of the equipment, and, unless the Surveyors are satisfied of their efficiency, the figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See also* Section 46.)

By Order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

2nd July, 1888.

FORM OF REPORT.

FORM No. 1 FOR WOOD SHIPS.—FORM OF THE REPORT OF ORIGINAL SURVEY.

No. — Survey held at — Date, first survey — Last survey — 18—
on the — Master —

Official Number — Tonnage of houses on deck — Register tonnage, cut on beam —
 Tonnage under tonnage deck — Ditto of forecastle — Engine-room —
 Ditto of spardk. or awning dk. — Gross tonnage — Register tonnage, as a steamer, cut on
 Ditto of poop, or raised qr. dk. — Crew space, as per Rule — the beam —
 Built at — When built — Launched — By whom built — Owners —
 Port belonging to — Destined voyage — If Surveyed while Building, Afloat, or in Dry Dock —

Length as per Section 39.....Feet. Inches. | Extreme breadth...Feet. Inches. | Depth of Hold...Feet. Inches.
 Length of Keel..... | outside.....

Number of Decks — (Depth from limber-strakes to under side of lower deck beam —)

SCANTLINGS OF TIMBER.	IN SHIP.		REQUIRED PER RULE.		OUTSIDE PLANK.		Inches.		Dimensions of Ship per Register.	
	Sided.	Moulded.	Sided.	Moulded.			In ship.	Required per Rule.	length—breadth—depth—	
Timber and Space.....					Garboard Strakes...				INSIDE PLANK.	Inches.
Floors.....					Garboard to Bilge..					
1st Foothooks					Bilge Planks				In ship.	Required per Rule.
2nd Ditto					Bilge to Wales.....					
3rd Ditto					Wales				In ship.	Required per Rule.
Top Timbers.....					Topsides					
Deck Beams No. — { Average					Sheerstrakes.....				In ship.	Required per Rule.
Deck Beams, lengthamidships					Planksheers					
Hold Beams No. — { Average					Waterways—				In ship.	Required per Rule.
Hold Beams, lengthamidships					Upper Deck					
Keel					Lower Deck				In ship.	Required per Rule.
Scarpns of Ditto					Do. faying surface					
Keelsons					against Timbers				In ship.	Required per Rule.
Scarpns of ditto					Upper Deck					

SIZE OF BOLTS IN FASTENINGS, DISTINGUISHING WHETHER COPPER, YELLOW METAL, OR IRON; ALSO OF TREENAILS.

	Copper or Y.M. in Ship.	Iron in Ship.	Inches required per Rule.		Copper or Y.M. in Ship.	Iron in Ship.	Inches required per Rule.
Heel-Knee and Deadwood abaft ...				Butt End Bolts			
Scarpns of Keel, No.....				Short Bolts in Ceiling			
Keelson Bolts through Keel at each Floor				Pintles of the Rudder.....			
Bolts through Heels of Timbers against Deadwood				Hold Beam { Waterway.....			
Frame Bolts				Bolts in { Knees			
Transoms and Throats of Hooks ...				{ Shelf or Clamp.....			
Arms of Hooks				Deck Beam { Waterway.....			
Through Bilge and Limber Strakes				Bolts in { Knees			
Thickstiff over Double Floors.....				{ Shelf or Clamp.....			
				Nails or Bolts in Flat of Deck ...			
				Treenails — Inches.....			

TIMBERING.—The Space between the Floor Timbers and Lower Foothooks is — inches.

The Space between the Top Timbers is — inches.

The Floors consist of — The First Foothooks of —

The Second Foothooks of — The Third Foothooks and Top Timbers of —

The Main Keelson is — and — free from all defects.

The Shifts of the First and Second Foothooks are not less than —

(The Rider Keelson is —)

[N.B.—When less than prescribed by the Rule, state how many.]

The Transoms, Knight Heads, Hawse Timbers, and Aprons, of — Deadwood, of — and — The Stem and Stern Post of — free from all defects.

The Deck and Hold Beams of — The Breasthooks of — The Knees of — The Main piece of Rudder of — Windlass of — (The Keel of —)

The rest of the Shifts of the Frame are — The Frame is — squared from the First Foothook heads upwards, and — free from sap, and from thence downwards the Frame is —

The — Frames are — bolted together to the gunwale. [N.B.—If not, state how bolted.]

The butts of the Timbers are — close together; their thickness not less than — of the entire moulding at that place.

The Frame is — chocked with — Butt at each end of the chock.

PLANKING OUTSIDE.—From the top of the keel to two-fifths the depth of Hold, the Plank is —

From the above-named height to the Wales —

The Wales and Blackstrakes — The Topsides and Sheerstrakes —

The Spirketting and Planksheers — The Waterways } Upper Deck —
Lower deck —

The Decks — State of —

The Shifts of the Planking are not less than — set — inches. [N.B.—If less than prescribed by the Rule, state whether general or partial, and if partial, in what part of the Ship.]

The Planking is wrought — between, and without step-butt.

PLANKING INSIDE.—The Limber-strakes and Bilgestrakes are —

The Ceiling, Lower Hold, and between Decks — Shelf Pieces and Clamps —

FASTENINGS.—To Hold Beams — Deck Beams —

Number of Breasthooks — Pointers — Crutches —

Butt End Bolts are of — in the Bottom — Bolts in each Butt End — through and clenched. Bilge and Limber Strakes — bolted through and clenched.

Treenails of — How made — Thickstuff over Double Floors — bolted through and clenched. General Quality of Workmanship —

We certify that the above is a correct description of the several particulars therein given,

Builder's Signature —

Surveyor's Signature —

No.	SAILS.	CABLES, &c.	Fthms	in.	Test as per Certif.	Inches	Test as per rule	Test as per rule	ANCHORS,	No.	Wght. ex Stock.	Test as per Certif.	Wght. req'd. per rule	Test as per rule
	Fore Sails,	Chain*							&c.					
	Fore Top Sails,	Hempen Stream Cable												
	Fore Topmast Stay	Hawser							Bowers* ...					
	Sails,	Towlines							Stream					
	Main Sails	Warp												
	Main Top Sails, and	All of — quality							Kedges.....					

* State Machine where Tested, Date or No. of Certificate, and name of Superintendent.

Her Masts, Yards, &c. are in — condition, and sufficient in size and length.

Her standing and running Rigging — sufficient in size and — in quality.

She has — Long Boat and — The present state of the Windlass is —

Capstan — and Rudder — Pumps —

SCUPPERS, &c.—What arrangements are there beyond the scuppers on deck, for clearing upper deck of water, in case of a sea coming on board? —

CARGO HATCHWAYS.—How formed? — State size — If of extraordinary size, state how framed and secured? — What arrangements for shifting beams? —

HATCHES, themselves, whether strong and efficient? — MAIN HATCHWAYS.—State size —

Order for Special Survey, Dates of Sur- { 1st. When the Frame is completed —
No. — Date — veys held while { 2nd. When the Beams are put in, &c. —

Order for Ordinary Survey, building, as per { 3rd. { When completed, and before the plank be painted
No. — Date — Section 35. { or paid —

No.—in Builder's Yard.

General Remarks.

Present condition of Caulking of Bottom — Deck — and Waterways —

If Sheathed, Doubled, Felted, Coppered, or Yellow Metalled — When last done —

I am of opinion this Vessel should be classed —

The amount of the Entry Fee.....£ : : is received by me, }
Special£ : : —188— }
Certificate..... : :

Surveyor.

{ Travelling Expenses, if any, £—.)

Committee's Minute —18—

Character assigned —

FORM OF REPORT.

FORM No. 1 FOR IRON SHIPS.

No. — Survey held at — Date, first survey — Last survey — 18— on the
Master —

Official number —
Tonnage under tonnage deck —
Ditto of third, spar, or awning deck —
Ditto of poop or raised quarter deck —
Ditto of houses on deck —
Ditto of forecastle —
Gross tonnage —
Less crew space —
Less engine-room —
Register tonnage, as cut on beam —

ONE OR TWO-DECKED, THREE-DECKED VESSEL,
SPAR, OR AWNING-DECKED VESSEL.

Feet.
Half-breadth (moulded)
Depth from upper part of keel to top of upper
deck beam
Girth of half midship frame (as per rule)
1st Number
1st Number, if in three-decked vessel deduct 7 ft.
Length
2nd Number
Proportions, breadths to length
Depths to length, upper deck to keel
Ditto main deck ditto

Built at — When built — Launched — By whom built — Owners — Residence —
Port belonging to — Destined voyage — If Surveyed while Building, Afloat, or in Dry
Dock —

Length on deck, as per rule	Feet.	Inches.	Horse.	No. of Decks with flat laid
Breadth, Moulded				No. of Tiers of Beams
Depth top of Floors to Upper Deck Beams			Power of Engines	
Ditto, Main Deck Beams				
Dimensions of Ship per Register, length		breadth	depth	depth moulded

	Inches in Ship.			Inches per Rule.			Required In Ship, per Rule.			
	Inches.	Inches.	16ths.	Inches.	Inches.	16ths.	Inches.	16ths.	Inches.	16ths.
Keel, depth and thickness										
Stem, moulding and thickness										
Stern-post for Rudder, do. do. for Trough										
Distance of Frames from moulding-edge to moulding-edge all fore and aft				(Class)						
Frames, Angle Iron, for $\frac{1}{2}$ length amidships for $\frac{1}{4}$ at each end				In Ship.			Required per Rule.			
Reversed Frames, Angle Iron										
Floors, depth and thickness of Floor Plate at mid line for half length amid- ships										
" thickness at ends of vessel										
" depth at $\frac{1}{2}$ the half-breadth, as per Rule										
" height extended at bilges										
Beams, Upper Spar, or Awning Deck, single or double Angle Iron, Plate or Tee Bulb Iron										
" Single or double Angle Iron on upper edge										
" Average space										
" Main or Middle Deck, single or double Angle Iron, Plate or Tee Bulb Iron										
" Single or double Angle Iron on upper edge										
" Average space										
" Lower Deck, single or double Angle Iron, Plate or Tee Bulb Iron										
" Single or double Angle on Iron upper edge										
" Average space										
" Hold, or Orlop, single or double Angle Iron, Plate or Tee Bulb Iron										
" Single or double Angle Iron on upper edge										
" Average space										
Keelsons, centre line, single or double plate, box, or intercostal, Plates										
" Rider Plate										
" Bulb Plate to Intercostal Keelson										
" Angle Irons										
" Double Angle Iron Side Keelson										
" Side Intercostal Plate										
" Angle Irons										
" Attached to outside plating with Angle Iron										
Bilge Angle Irons										
" Bulb Iron										
" Intercostal Plates riveted to plating for — length										
" Stringer Angle Irons										
" Intercostal Plates riveted to plating for — length										
Side Stringer Angle Irons										

Flat Keel Plates, breadth and thickness ..
Plates in Garboard Strakes, breadth and
thickness from Garboard to upper
part of Bilges ..
" of doubling at Bilge, or increased
thickness, and length applied
" from upper part of Bilge to lower
edge of Sheerstrake ..
" Main Sheerstrake, breadth and
thickness ..
" of doubling at Sheerstrake, and
length applied ..
" from Main to Upper or Spar Deck
Sheerstrake ..
" Upper or Spar Deck Sheerstrake
breadth and thickness ..
Butt Straps to outside plating, breadth
and thickness ..
Lengths of Plating ..
Shifts of Plating, and Stringers ..
Gunwale Plate on ends of Awning, Spar,
or Upper Deck Beams, breadth
and thickness ..
Angle Iron on ditto ..
Tie Plates (fore and aft), outside Hatchways
Diagonal Tie Plates on Beams (No. of
pairs,) ..
[State clearly where plating is of alternate
thicknesses—as distinguished from
diminished thickness at ends of
vessel]
Flat of Upper, Spar, or Awning Deck*
How fastened to Beams ..
Stringer Plate on ends of Main or Middle
Deck Beams, breadth and thickness
(Is the Stringer Plate attached to the out-
side plating?)
Angle Irons on ditto (No.) ..
Tie Plates, outside Hatchways ..
Diagonal Tie Plates on Beams (No. of
pairs,) ..
Flat of Middle Deck,* ditto ditto
How fastened to Beams ..
Stringer Plate on ends of Lower Deck,
Hold, or Orlop Beams ..
(Is the Stringer Plate attached to the out-
side plating?)
Angle Iron ditto (No.) ..
Stringer or Tie Plates, outside Hatchways
Flat of Lower Deck* ..
Ceiling betwixt Decks, thickness and
material ..
" in hold ditto ditto ..
Main piece of Rudder, diameter at head ..
" at heel ..
* If Iron Deck, state if whole or part,
and if wood deck is laid thereon.

(Can the rudder be unshipped afloat? —————)

Bulkheads, No. ————— No. per Rule ————— Thickness of —————
 Ditto, Height up ————— How secured to sides of ship —————
 Ditto, Size of Vertical Angle Irons, ————— and distance apart, ————— inches.
 Ditto, Are the outside Plates doubled two spaces of Frames in length? —————
 The Frames extend in one length from ————— to ————— riveted through plates with — in.
 rivets, about — apart.
 The Reversed Angle Irons on floors and frame extend ————— middle line to ————— and
 to ————— alternately.
 Keelsons. Are the various lengths of plates and angle irons properly connected? ————— And butts
 properly shifted? —————
 Plating. Garboard, double riveted to keel, with rivets — in. diameter, averaging — inches from
 centre to centre.
 „ Edges of Garboards and to upper part of bilge, worked clencher, double riveted; with rivets
 — in. diameter, averaging — inches from centre to centre.
 „ Butts from Keel to turn of Bilge, worked carvel, double riveted; with rivets — in. diameter,
 averaging — inches from centre to centre.
 „ Butts of — strakes at Bilge for — length, treble riveted with butt
 straps — thicker than the plates they connect.
 „ Edges from Bilge to Main Sheerstrake, worked clencher, double or single riveted; with rivets
 — in. diameter, averaging — inches from centre to centre.
 „ Butts from Bilge to Main Sheerstrake, worked carvel, double riveted; with rivets — in.
 diameter, averaging — inches from centre to centre.
 „ Edges of Main Sheerstrake, double or single riveted. Upper Sheerstrake, double or single
 riveted.
 „ Butts of Main Sheerstrake, treble riveted for — length amidships. Butts of Upper or
 Spar Sheerstrake, treble riveted — length amidships.
 „ Butts of Main Stringer Plates, treble riveted for — length amidships. Butts of Upper
 or Spar Stringer Plate, treble riveted for — length.
 „ Breadth of laps of plating in double riveting —. Breadth of laps of plating in single
 riveting —.
 Butt Straps of Keelsons, Stringer and Tie Plates, treble, double, or single riveted? —————
 No. of breasthooks ————— crutches —————
 What description of iron is used for Frames, Beams, Keelsons, Tie and Stringer Plates, Outside Plating, &c.? —
 Manufacturer's Name or Trade Mark —————

The above is a correct description.

————— *Builder's Signature.*

————— *Surveyor's Signature.*

Surveyor to Lloyd's Register of British and Foreign Shipping.

WORKMANSHIP.—Are the butts of plating planed or otherwise fitted? —————

Do the edges of the carvel work and of the butts lay close together throughout their length without
 requiring any making good of deficiencies? —————

Are the fillings between the ribs and plates solid single pieces? —————

Do the holes for riveting plate to frames, butt straps, or plate to plate, &c., conform well to each
 other? —————

Are the rivet holes well and sufficiently countersunk in the plate and punched from the laying surfaces? —

Do any rivets break into or through the seams or butts of the plating? —————

Masts, Bowsprit, Yards, &c. are ————— in ————— condition, and sufficient in size and length.

*If of Iron or Steel, give Scantlings of Plating, Angle Irons, &c., and further explain by a Sketch,
 showing how the lower Masts and Bowsprit are constructed, showing the number of Plates and Angle
 Irons, mode of riveting, quality of Materials, and if stamped with Maker's name.*

State also Length and Diameter of Lower Masts and Bowsprit —————.

No. FOR EQUIPMENT			Ethms.	In.	Test per Certif.	Inches per Rule.	Machine where testd, & Supplied.	ANCHORS, &c.	No.	Wght. of Stock.	Test per Certif.	Weight required per Rule.	Machine where tested, & Supplied.
No.	SAILS.	CABLES, &c.											
	Foresails	Chain*						Bower*					
	Fore Top Sails	Iron Stream Chain						Stream					
	Fore Topmast Stay	or Steel Wire						Kedge					
	Sails	or Hempn Strm Cable						2nd Kedge					
	Main Sails	Towline, Hemp or											
	Main Top Sails, and	Steel Wire											
		Hawser											
		Warp											
		Quality											

* State Machine where Tested, Date or No. of Certificate, and Name of Superintendent.

Standing and Running Rigging ——— sufficient in size, and ——— in quality.

She has ——— Long Boat and ———

The Windlass is ——— Capstan ——— and Rudder ——— Pumps ———

ENGINE ROOM SKYLIGHTS.—How constructed?— How secured in ordinary weather?— What arrangements for deadlights in bad weather?—

COAL BUNKER OPENINGS.—How constructed? How are lids secured?— Height above deck?—

SCUPPERS, &c.—What arrangements for clearing upper deck of water, in case of shipping a sea?—

CARGO HATCHWAYS.—How formed?— State size MAIN HATCH ——— Forehatch ———

Quarter-hatch ——— If of extraordinary size, state how framed and secured?— What arrangement for shifting beams?— Hatches, if strong and efficient?—

Reference should be made to any correspondence connected with the case.

Order for Special Survey

No. ———

Date ———

Order for Ordinary Sur-

vey No. ———

Date ———

No.—in Builder's Yard.

Dates of
Surveys held
while building,
as per Section
18.

- 1st. On the several parts of the frame, when in place, and before the plating was wrought ———
- 2nd. On the plating during the process of riveting ———
- 3rd. When the beams were in and fastened, and before the decks were laid ———
- 4th. When the ship was complete, and before the plating was finally coated or cemented ———
- 5th. After the ship was launched and equipped ———

State dates of letters respecting this case ———

GENERAL REMARKS. (*State quality of Workmanship, &c.*)

State if one, two, or three-decked vessel, or if spar or awning decked, and the lengths of poop, bridge, fore-castle, or raised quarter deck. (If double bottom, state particulars on separate form.)

How are the surfaces preserved from oxidation? Inside ——— Outside ———

I am of opinion this vessel should be classed ———

The amount of the Entry Fee£ : : is received by me, {
Special£ : : ——— 188 — }

(To be sent as per margin.) Certificate

Travelling Expenses (if any) £——

Committee's Minute ——— 188 —

Character assigned ———

(*The Surveyors are requested not to write on or below the space for Committee's Minute.*)

Surveyor to Lloyd's Register of British and Foreign Shipping.

FORM NO. 2 FOR REPORT OF SURVEY FOR REPAIRS, ETC.

No. — Port of — Survey held at — Date, First Survey — Last Survey —
 18 — on the — Master — Tonnage — Built at — By whom — When —
 Owners — Port belonging to — Owner's Address — If Surveyed afloat or in dry
 dock — Name of Dock — Destined Voyage —

Length of Poop — ft.; of Forecastle — ft.; of Raised Qr. Deck — ft.; Moulded Depth — ft. — ins.
 Last Survey, No. — Port — Classed —

State clearly the cause of repairs if any, and, in detail, the nature and extent of examinations and subsequent repairs. Repairs on account of damage should be separated from repairs due to other causes.
 State also the dates and initials of any letters respecting this case —

Society's freeboard (if assigned) as painted on ship, in summer — ft. — ins.; in winter — ft. — ins.

Repairs, or Examination as per Rule, for —

Present condition of the

Decks
 Waterways
 Comings
 Upper Deck Beams and Fastenings
 Lower Deck Beams and Fastenings
 Plank sheers
 Sheerstrakes
 Topsides
 Wales
 Plank (Bottom) and Counter
 Treennails or Rivets

Breasthooks and Stemson
 Transoms, Pointers, and Crutches
 Timbers of Frame at the openings
 Ditto at other places
 Keelsons
 Clamps and Shelves
 Ceiling
 Rudder
 Windlass and Capstan
 Pumps
 Cement (if Iron Ship)

Caulking of Bottom, Deck, and
 Waterways
 Copper, or Y. M. ... When put on ...
 Boats
 Masts, Yards, &c.
 Condition, how ascertained
 Sails
 Anchors, No. of
 Cables
 Hawseers and Warps
 Standing and Running Rigging ...

Engine Room Skylights — Coal Bunker, Openings, Lids, &c. — Scuppers —
 Cargo and Main Hatchways — Hatches —

General Observations, Opinion as to Class, Recommendation, &c.

Committee's Minute — 18

Character assigned —

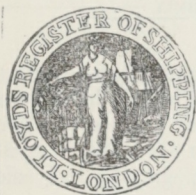
— Surveyor to Lloyd's Register of British and Foreign Shipping.

No. 7.—FORM OF CERTIFICATE OF CHARACTER.

Lloyd's Register of British and Foreign Shipping.

ESTABLISHED 1834.

No. —



No. 2, White Lion Court, Cornhill,
 London, 18

These are to Certify, That the — of —
 Master, — Tons, bound to — has been Surveyed at
 by the Surveyors to this Society, and reported to be, on the —

and that she has been CLASSED and entered in the REGISTER BOOK of this Society with the Character —

Charge — Secretary.

Witness my hand, — Chairman.

No. 8—FORM OF ENGINEER-SURVEYOR'S REPORT ON MACHINERY.

No. — No. in Reg. Book. Survey held at — Date, first Survey — Last Survey — 18—
 (Number of Visits —) on the — Tons — Master — Built at — By whom
 built — When built — Engines made at — By whom made — When made —
 Boilers made at — By whom made — When made — Registered Horse Power —
 Owners — Port belonging to —

ENGINES, &c.

Description of engines — Diameter of cylinders — Length of stroke — No. of revolutions
 per minute — Point of cut off, high pressure — Low pressure — Diameter of screw
 shaft — Diameter of tunnel shaft — Diameter of crank shaft journals — Diameter of
 crank pin — Size of crank webs — Diameter of screw — Pitch of screw — No.
 of blades — State whether movable — Total surface — No. of feed pumps —
 Diameter of ditto — Stroke — Can one be overhauled while the other is at work — No.
 of bilge pumps — Diameter of ditto — Stroke — Can one be overhauled while the other
 is at work — Where do they pump from — No. of donkey engines — Size of pumps —
 Where do they pump from — Are all the bilge suction pipes fitted with roses — Are the roses
 always accessible — Are the sluices on engine-room bulkheads always accessible — No. of
 bilge injections — and sizes — Are they connected to condenser or to circulating pump —
 How are the pumps worked — Are all connections with the sea direct on the skin of the
 ship — Are they valves or cocks — Are they fixed sufficiently high on the ship's side to be
 seen without lifting the stokehold plates — Are the discharge pipes above or below the deep water-
 line — Are they each fitted with a discharge valve always accessible on the plating of the
 vessel — Are the blow-off cocks fitted with a spigot and brass covering plate — What pipes
 are carried through the bunkers — How are they protected — Are all pipes, cocks, valves,
 and pumps in connection with the machinery accessible at all times — Are the pipes, cocks,
 and valves arranged so as to prevent an unintentional connection between the sea and the
 bilges — When were stern tube, propeller, screw shaft, and all connections examined in dry
 dock — Is the screw shaft tunnel watertight — and fitted with a sluice door — worked
 from —

BOILERS, &c.

Number of boilers — Description — Whether steel or iron — Working pressure — Tested
 by hydraulic pressure to — Date of test — Description of superheating apparatus or steam
 chest — Can each boiler be worked separately — Can the superheater be shut off and
 the boiler worked separately — No. of square feet of fire grate surface in each boiler —
 Description of safety valves — No. to each boiler — Area of each valve — Are they fitted
 with easing gear — No. of safety-valves to superheater — Area of each valve — Are
 they fitted with easing gear — Smallest distance between boilers and bunkers or woodwork —
 Diameter of boilers — Length of boilers — Description of riveting of shell, long. seams —
 Circum. seams — Thickness of shell plates — Diameter of rivet holes — Whether punched
 or drilled — Pitch of rivets — Lap of plating — Percentage of strength of longi-
 tudinal joint — Working pressure of shell by rules — Size of manholes in shell — Size
 of compensating rings — No. of furnaces in each boiler — Outside diameter — Length,
 top — bottom — Thickness of plates — Description of joint — If rings are fitted —
 Greatest length between rings — Working pressure of furnace by the rules — Combustion
 chamber plating, thickness, sides — back — top — Pitch of stays to ditto, sides —
 back — top — If stays are fitted with nuts or riveted heads — Working pressure of
 plating by rules — Diameter of stays at smallest part — Working pressure of ditto by
 rules — End plates in steam space, thickness — Pitch of stays to ditto — How
 stays are secured — Working pressure by rules — Diameter of stays at smallest parts —

Working pressure by rules — Front plates at bottom, thickness — Back plates, thickness — Greatest pitch of stays — Working pressure by rules — Diameter of tubes — Pitch of tubes — Thickness of tube plates, front — back — How stayed — Pitch of stays — Width of water spaces — Diameter of superheater or steam-chest — Length — Thickness of plates — Description of longitudinal joint — Diameter of rivet holes — Pitch of rivets — Working pressure of shell by rules — Diameter of flue — Thickness of plates — If stiffened with rings — Distance between rings — Working pressure by rules — End plates of superheater or steam-chest, thickness — How stayed — Superheater or steam-chest, how connected to boiler —

DONKEY BOILER.

Description — Made at — By whom made — When made — Where fixed — Working pressure — Tested by hydraulic pressure to — No. of certificate — Fire grate area — Description of safety valves — No. of safety valves — Area of each — If fitted with easing gear — If steam from main boilers can enter the donkey boiler — Diameter of donkey boiler — Length — Description of riveting — Thickness of shell plates — Diameter of rivet holes — Whether punched or drilled — Pitch of rivets — Lap of plating — Percentage of strength of joint — Thickness of crown plates — Stayed by — Diameter of furnace, top — bottom — Length of furnace — Thickness of plates — Description of joint — Thickness of furnace crown plates — Stayed by — Working pressure of shell by rules — Working pressure of furnace by rules — Diameter of uptake — Thickness of plates — Thickness of water tubes —

SPARE GEAR. State the articles supplied —

The foregoing is a correct description,

Manufacturer.

GENERAL REMARKS. State quality of workmanship, opinions as to class, &c. —

The amount of Entry Fee	£	:	:	received by me, {	_____
Special	£	:	:	_____18—	}
Donkey Boiler Fee	£	:	:		

{To be sent as per Margin} Certificate (if required)£ : :

Engineer-Surveyor to Lloyd's Register of British and Foreign Shipping.

Travelling Expenses, if any, £ _____

Committee's Minute _____

FORM NO. 9 FOR REPORT OF SURVEY FOR REPAIRS, &c., OF ENGINES AND BOILERS.

No. — Port of — Survey held at — Date, First Survey — Last Survey —
 188 — on the Machinery of the — Master — No. of Visits — Vessel built at —
 By whom — When — Tonnage, Gross — Net — Registered Horse
 Power — Engines made at — When — Boilers, when made (Main) —
 (Donkey) — No. of Main Boilers — Steam Pressure, in Main Boilers — in Donkey
 Boiler — Owners — Port — Voyage — If Surveyed Afloat or in Dry
 Dock — Class of Vessel and Machinery —

Last Survey, No. — Port —

Particulars of Examination and Repairs (if any) —

State clearly the cause of repairs if any, and, in detail, the nature and extent of examinations and subsequent repairs. Repairs on account of damage should be separated from repairs due to other causes.

State also the dates and initials of any letters respecting this case —

Did the Surveyor personally go inside each Boiler separately (including the Donkey Boiler, if any) and make a thorough examination at this time? —

If this was not done, state for what reasons? —

And what parts of the Boilers could not be thus thoroughly examined? —

Also what special means, in the absence of internal examination, were adopted by the Surveyor to assure himself of the thorough efficiency of those parts of each boiler? —

General Observations, Opinion, and Recommendation: —

Committee's Minute —

Assigned —

*Engineer Surveyor to Lloyd's Register
of British and Foreign Shipping*

FORM No. 10.—FORM OF CERTIFICATE OF LLOYD'S M.C. FOR BOILERS
AND ENGINES.

Lloyd's Register of British and Foreign Shipping.
ESTABLISHED 1834.



No. —

No. 2, White Lion Court, Cornhill,

London

188

These are to Certify, That the Engines and Boilers of the
_____ of _____ Master _____ Tons, have
been surveyed at _____ by the Engineer-Surveyors to this Society, and reported to be
on the _____ in good, efficient, and safe working condition, and that the Record
LMC. (in red) _____ (Lloyd's Machinery Certificate), has been made in the Register Book accordingly.
_____ Witness my hand,

Secretary.

Chairman.

Charge

FORM No. 11.—FORM OF CERTIFICATE OF B&MS. FOR BOILERS AND ENGINES.

Lloyd's Register of British and Foreign Shipping.
ESTABLISHED 1834.

No. —

No. 2, White Lion Court, Cornhill,

London,

188

These are to Certify, That the Boilers and Machinery of the
_____ of _____ Master _____ Tons, have
been surveyed at _____ by the Engineer-Surveyors to this Society and reported to be
on the _____ in good and efficient condition, and that the Record B&MS. (in red) _____
(Boilers and Machinery Surveyed), has been made in the Register Book accordingly.

Secretary.

Witness my hand, _____ Chairman.

Charge

FORM OF CERTIFICATE OF THE CLASSIFICATION OF SHIPS IN THE LATE
UNDERWRITERS' REGISTER OF IRON VESSELS.

Lloyd's Register of British and Foreign Shipping.
ESTABLISHED 1834.

Amalgamated 1885 with the Underwriters' Registry of Iron Vessels.

ESTABLISHED 1862.

No. —

No. 2, White Lion Court, Cornhill,

London,

188

This is to Certify That the _____
of _____, _____ Master, _____ Tons, bound to _____, has been surveyed
at _____ by the Surveyors to this Society, and reported to be on the _____
in a good and efficient state, and fit to carry dry and perishable Cargoes to and from all parts of the
World, and that she has been continued as Classed and is entered in the Register Book of this Society
with the Character _____ subject to periodical Surveys.

Secretary.

Witness my hand,

Chairman.

Charge

CIRCULAR No. 560.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

September 26th, 1885.

FREEBOARD.

SIR,

I am directed to acquaint you that the Committee of this Society have adopted the amendments recommended in the Report of the Load-line Committee in the Tables for Freeboard hitherto issued by this Society.

I send to you some copies of the Tables thus adopted, bearing date 17th September, 1885, and I request you will be guided in accordance therewith in your future surveys for freeboard, and your reports thereon.

A further supply of the Tables will be sent to you on your applying for them.

I am, your obedient servant,

BERNARD WAYMOUTH,

Secretary.

NOTICE No. 572.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

FREEBOARD.

The Committee of this Society having at a meeting held this day adopted the amendments to the Tables of Freeboard agreed upon by the Load Line Committee and submitted to the Board of Trade, are prepared to assign Freeboards to all vessels whether classed in the Society's Register Book or not on the basis of the Amended Tables, provided the following conditions be complied with, viz. :—

- 1.—The request shall be in writing.
- 2.—The Owner shall state in the form of request what in his opinion would be a suitable freeboard for the vessel.
- 3.—The vessel shall, if required, be surveyed in dry dock by one of the Society's Surveyors, who will report to the Committee before the Freeboard is determined.
- 4.—The minimum Freeboard in *salt* water determined by the Committee shall, if accepted by the owner, be adopted by him as that required by the Merchant Shipping Act of 1876 to be marked by a disc on the sides of the vessel. In the cases of Steam Vessels the disc shall be placed at the line for summer voyages, and the line for winter voyages indicated by marks painted below the summer line.

5.—The maximum draught in *fresh* water will also be indicated by the Committee, and is to be shown by marks painted above the load-line in *salt* water, as shown in the illustration to the following paragraph.

6.—The letters **L R** shall be painted on the sides of the vessel, one before and the other abaft the bar passing through the disc required by Act of Parliament as per sketch, and the position of the disc and bar shall in the case of Iron or Steel Vessels be further permanently shown by centre-punch marks, thus :—

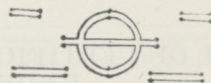
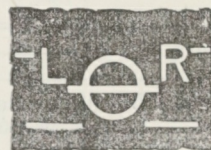
And, in the case of Wood Ships, the horizontal bars shall be sunk for their breadths into the planking, a depth of not less than one quarter of an inch.

The Freeboard (Summer and Winter in the cases of Steam Vessels) to the main deck, spar deck, or awning deck, as the case may be, will be recorded in the Society's Register Book.

2, WHITE LION COURT, CORNHILL, LONDON, E.C.
17th September, 1885.

By order of the Committee,
BERNARD WAYMOUTH, Secretary.

N.B.—The Freeboard assigned by the Committee is not to be considered suitable or sufficient if the vessel be engaged in the North Atlantic trade, sailing to or from the Mediterranean or any British or European port, or sailing from or calling at ports in British North America or eastern ports in the United States north of and including Baltimore, from October to March inclusive, but should be increased as provided for in the Tables of Freeboard.



LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

No.—

No. 2, White Lion Court, Cornhill,
London, 188

These are to Certify That the _____ of _____ Tons, has been assigned by the Committee of Lloyd's Register of British and Foreign Shipping, a FREEBOARD as follows, viz. _____ in Salt Water† _____ in Fresh Water, and that this Freeboard has been marked on the vessel's sides, and recorded in the Society's Register Book in accordance with Notice No. 471* (as at foot).

Witness my hand,

Secretary,

Chairman.

Charge

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

AND THE

UNDERWRITERS' REGISTRY FOR IRON VESSELS
AMALGAMATED.

NOTICE IS HEREBY GIVEN that it has been mutually resolved by the Committee of Lloyd's Register of British and Foreign Shipping and the Committee of the Underwriters' Registry for Iron Vessels to amalgamate the two Registries.

In accordance with the terms of amalgamation :

- (1.) The publication of the "Underwriters' List of Iron Vessels" has been discontinued.
- (2.) Vessels holding a Class in the Underwriters' Registry will be entitled to the publication of this Class in future issues of Lloyd's Register Book so long as their Owners comply with the Rules of the Underwriters' Registry (1884-85) relating to Periodical Surveys.
- (3.) The information hitherto given in the Supplements to the Register Book of the Underwriters' Registry relating to Periodical Surveys, Changes of Owners, &c., will be inserted by posting with type in Lloyd's Register Book, and will also appear in the Supplements.
- (4.) In case the Owners of Vessels holding a Class in the Underwriters' Registry only, desire also a class under Lloyd's Register, the Committee of this Society undertake to favourably consider the claims of such Vessels on the documents produced by the Underwriters' Registry, and the necessary surveys as to present condition, with a view to assigning these Vessels the highest possible Class to which they are entitled, free of charge to the Owners. Full allowance will be made for any compensation for deviation from the Rules of Lloyd's Register, and the Vessels given the advantage of any difference in scantlings between the Rules as now existing and those which were in force when the Vessels were built.

The Committee of this Society will employ the Staff of the Underwriters' Registry, so far as may be practicable, in the Survey of Vessels holding a Class in that Registry, and of Vessels now Building or Contracted to be Built to Class therein.

In the interest of the Owners of Vessels Classed in the Underwriters' Registry, some Members of the Committee of that Registry will have seats on Lloyd's Register Committees in London and Liverpool.

All communications respecting Vessels Classed or now Building to Class in the Underwriters' Registry, should in future be addressed to the Secretary to Lloyd's Register, either in London or Liverpool, as may be most convenient.

In the absence of any intimation from Owners of Ships classed in the Underwriters' Registry to the contrary, it will be concluded that they are quite agreeable to the Classes assigned in that Registry being recorded in Lloyd's Register Book as proposed.

By order of the Committee,

B. WAYMOUTH,

Secretary.

Lloyd's Register of British and Foreign Shipping,

2, White Lion Court, Cornhill, London,

1st September, 1885.

No. 573.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

FREEBOARD.

AWNING-DECKED STEAM VESSELS.

With reference to Notice No. 572, on the Freeboard of Vessels,

NOTICE is hereby given that, in regard to awning-decked vessels already classed in the Society's Register Book, the Owners of such vessels will be allowed the option either of retaining the mark prescribed in Circular No. 354 for indicating the load-line of awning-decked vessels, or of having their vessels marked in accordance with the conditions of the following paragraphs, numbered 1, 2 and 3.

In respect to awning-decked vessels built in future, the marking as prescribed in Circular No. 354 will be discontinued, and to entitle vessels of this description to classification in the Society's Register Book, the following conditions shall be complied with, in addition to the requirements set forth in Section 43 of the Society's Rules for Iron Vessels, viz. :—

1.—The minimum freeboard in *salt* water determined by the Committee shall be adopted by the Owner as the load-line required by the Merchant Shipping Act of 1876 to be marked by a disc on the sides of the vessel. The disc shall be placed at the line for summer voyages, and the line for winter voyages indicated by marks placed below the summer line.

2.—The maximum draught in *fresh* water will also be indicated by the Committee, and is to be shown by marks painted above the maximum load-line in *salt* water, as shown in the illustration to the following paragraph.

3.—The letters **L R** shall be painted on the sides of the vessel, one before and the other abaft the bar passing through the disc required by Act of Parliament, as per sketch, and the position of the disc and bar shall be further permanently shown by centre-punch marks, thus :—

The Freeboard to the awning-deck (summer and winter) will be recorded in the Society's Register Book.

By order of the Committee,

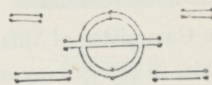
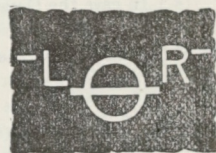
BERNARD WAYMOUTH

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

17th September, 1885.

N.B.—It is a condition on which an awning-decked vessel is classed in the Society's Register Book that the Freeboard assigned shall be marked on the vessel's sides as above prescribed; and, under the provisions of Section 43 of the Society's Rules for Iron Ships, if the vessel be loaded to a greater draught of water than that assigned by the Committee, or if the mark indicating the maximum load draught be placed higher than the position assigned by the Committee, the vessel will thereby forfeit her Character in the Register Book.



LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CIRCULAR No. 306.

AWNING-DECKED STEAMERS.

It being a condition in the Rules of Lloyd's Register of British and Foreign Shipping that "*in Awning-decked vessels there must be scuppers and ports at the main deck through the side to discharge water,*" and it having come to the knowledge of the Committee that in certain cases the scuppers and ports have been permanently closed, in contravention of the above Regulation, and the Committee having expunged the character assigned to a vessel which has been so dealt with:—

NOTICE IS HEREBY GIVEN to the owners of Awning-decked Vessels classed in Lloyd's Register Book, that in any cases brought to the knowledge of the Committee of the closing of the scuppers or the securing of the ports in such vessels, contrary to the Regulation in question, they will immediately suspend the Character assigned to them.

By order of the Committee,

BERNARD WAYMOUTH, *Secretary*.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

No. 2, White Lion Court, Cornhill, London, E.C., 27th February, 1873.

No. 314.

AWNING-DECKED VESSELS.

NOTICE IS HEREBY GIVEN that, with reference to the Rule requiring that "*in Awning-decked vessels there must be scuppers and ports at the main deck through the side, to discharge water,*" the Committee have passed the following Resolutions, viz.:

"In the case of the vessels *now* building, provided *every* frame be extended to the awning deck and a load-line submitted to the Committee be approved by them, ports and scuppers may be dispensed with."

"In all cases in which, in consequence of a *load-line* having been agreed upon as the ground for dispensing with ports and scuppers, should the vessel's draught in *salt water* exceed that indicated by the load-line, she shall cease to be entitled to a class in the Register Book, whilst so loaded; and in all cases where a class has been assigned to a vessel having ports and scuppers, such class will be forfeited if the ports and scuppers be closed."

"The load-line so agreed to by the General Committee is to be inserted in the *Certificates* and in the *Register Book*."

"Awning-decked Ships which have *already* been allowed to have ports and scuppers closed, are to have their load-line inserted in their *Certificates of Classification*, and recorded in the *Register Book*."

By order of the Committee,

No. 2, White Lion Court, Cornhill, London, E.C., 21st August, 1873.

BERNARD WAYMOUTH, *Secretary*.

CIRCULAR No. 340.

AWNING-DECKED STEAMERS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

No. 2, White Lion Court, Cornhill, London, E.C., 8th December, 1875.

With reference to the Notices, numbered 305 and 314, issued by the Committee of this Society in February, and August, 1873, calling attention to the conditions under which Awning-decked Vessels are classed in the Register Book, I am directed in forwarding to you copies of those notices, to acquaint you that the Committee, having become aware that the condition on classification, that the Ports and Scuppers at the main deck must remain open for the discharge of water, continues to be contravened, have resolved, that in *all* cases, of Awning-decked Vessels classed in the Register Book, a load-line shall be determined on for them, to be marked on the Ship's side, and recorded in the Register Book and on the Certificate of Classification.

Under these circumstances, I am to request you will submit to me for the Committee's consideration the load-line you suggest for adoption in the case of your Iron Screw Steamer.....

I have to add, that in every instance of non-compliance with this requirement within six months of the date hereof, the character of the vessel will be expunged from the Register Book.

I am,.....

Your obedient Servant,

(Signed)

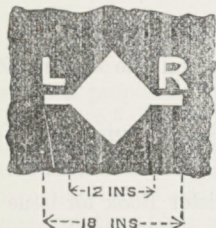
B. WAYMOUTH, *Secretary*.

CIRCULAR No. 354.

AWNING-DECKED STEAMERS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

No. 2, White Lion Court, Cornhill, London.



With reference to the Circular Letter, numbered 340, issued by the Committee of this Society in December, 1875, conveying their Resolution, that in all cases of Awning-decked Vessels classed in the Register Book, a load-line shall be determined on for them, to be marked on the ship's side, and recorded in the Register Book and on the Certificate of Classification, I am to acquaint you that the Committee having understood that the above requirement as to the marking of the load-line on the ship's side, has not in all cases been complied with, they hereby call attention thereto; and I am to add that the mark decided upon by the Committee, to be painted on each side of the ship as nearly amidships as practicable, shall be a diamond with a bar at each end, having the letter L above the left bar and the letter R above the right bar, as herein illustrated.

The centre of the bar to be the load-line.

I am,.....

Your obedient Servant,

B. WAYMOUTH, *Secretary*.

To be White or Yellow on a dark ground, or Black on a light ground.

CIRCULAR No. 369.

AWNING-DECKED STEAMERS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

No. 2, White Lion Court, Cornhill, London, E.C., 4th January, 1877.

I beg to refer you to my letter of the 8th December, 1875, with its enclosures (and of which I now transmit copies), acquainting you with the Committee's determination to expunge from the Register Book the Character assigned therein to the Awning-decked Screw Steamer..... unless a load-line be approved by the Committee for this vessel, and be marked on the ship's side, and recorded in the Register Book and on the Certificate of her Classification, and I am to add, that in the absence of a reply thereto the Committee feel it to be out of their power to continue the character of the vessel in the Register Book, and that, unless a satisfactory reply be received prior to the reprinting of the book in April next, the vessel's character will be expunged therefrom by a red line.

I at the same time enclose a circular letter, Numbered 354, showing the form of mark decided on by the Committee ship's side.

I am,.....

Your obedient Servant,

B. WAYMOUTH, *Secretary*.

[See also Circular on page 182.]

No. 643.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

EXPIRATION OF CHARACTER OF SHIPS CLASSED A, A IN RED, AND Æ.

NOTICE IS HEREBY GIVEN, that in pursuance of the Rules, Section 59 (as set forth below), and of a Resolution passed this day by the Committee of Lloyd's Register of British and Foreign Shipping:—

“All Ships classed A for a term of years, will, at the expiration of such term, or so soon after as may be practicable, have the word ‘*expired*’ inserted against their names in the Register Book, and, if not surveyed and re-classed prior to the reprinting of the Register Book for issue in July next, will appear therein without character.”

The foregoing Resolution will likewise apply to Ships classed A in Red, and Æ, whose period of exemption from special re-survey will terminate on the 31st December.

By order of the Committee,

BERNARD WAYMOUTH,

No. 2, White Lion Court, Cornhill, London, E.C.

Secretary.

10th November, 1887.

EXTRACT FROM THE RULES, SECTION 59.

“At the termination of the several periods assigned to Ships for remaining on the Character A or A in Red, they will have the word ‘*expired*’ inserted against them; and if not surveyed prior to the reprinting of the Register Book, they will appear without any character.”*

* The terms of years assigned to Ships on the Character A, launched *previously to the 1st July, 1859*, also of Ships launched during the *first six months of the years 1860, 1861, 1862, and 1863*, will expire on the 31st December of the last year of the periods assigned to them respectively.

The terms assigned to Ships launched during the *last six months of the years 1859, 1860, 1861, and 1862*, will expire on the 30th June next after the last year of the periods assigned to them respectively.

In the case of Ships launched on and after the 1st July, 1863, the period originally assigned to them on the A Character will in every case *date from the month* in which the vessel may be launched, and will expire at the end of the corresponding month in the year at which the period assigned terminates.

No. 644.

SHIPS CLASSED A IN RED, OR Æ.

The Rules, Sections 60 and 61, requiring that Ships classed A in Red, or Æ, shall be surveyed *annually*, or on their return from every foreign voyage,

NOTICE IS HEREBY GIVEN, that in accordance with the above Rules, and in pursuance of a Resolution passed this day by the Committee, the Characters of Ships classed A in Red, or Æ, which shall not have been surveyed since the year 1885, will be omitted in reprinting the Register Book for issue in July, 1888.

By order of the Committee,

BERNARD WAYMOUTH,

No. 2, White Lion Court, Cornhill, London, E.C.

Secretary.

10th November, 1887.

N.B.—In the case of Ships which it shall be made to appear, by letter addressed to the Secretary, have not been in any Port in the United Kingdom since 1885, the above Resolution will not be applied.

No. 432.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ANCHORS AND CABLES.

STEEL WIRE CABLES.

TABLE No. 22.

NOTICE.

NOTICE IS HEREBY GIVEN, that the Committee are prepared to sanction the supply of one flexible steel wire cable in steam vessels for which classification in the Society's Register Book is contemplated, in the place of one of the chain cables, provided the following conditions be complied with, namely :—

That the size of, and the proposed tests for, the steel wire cable be in the first place submitted to the Committee and receive their approval.

That the mode of attaching the steel wire cable to the anchor, the proposed weight and shape of the anchors intended to be used, and the nature of the proposed appliances for working the steel wire cables to be in the first instance submitted for the consideration and approval of the Committee, and that in the case of a steel wire cable being supplied, a notation be made after the name of the vessel of *steel wire cable exp'l.*

Table No. 22 has also been amended in the columns for stream chains, towlines, hawsers, and warps. See also the foot-note thereto.

By Order of the Committee,

BERNARD WAYMOUTH, *Secretary.*

No. 2, White Lion Court, Cornhill, London, E.C.

3rd June, 1880.

No. 437.

No. 2, White Lion Court, Cornhill, London, E.C.

12th August, 1880.

HAWSERS AND WARPS.

SIR,

With reference to the foot-note added, as per Notice, No. 432, dated 3rd June, 1880, to Table No. 22, to the effect that "Where a departure from the requirements of the Table for hawsers and warps is proposed, the same should be in all cases submitted in the first place for the approval of the Committee," I am directed to acquaint you that in the case of vessels built after the above date, the Committee will require an adherence to the equipment prescribed in the Table, unless their sanction for a departure therefrom has been previously obtained; and I am to request you will, in the event of your becoming aware of proposed departures from the Rules, lose no time in apprising the builders of the vessel of the above conditions.

I am to add, that in any case it is the duty of the Surveyor to draw the Committee's attention, either by letter or on his report on the vessel, to any departures from the Rules, with such remarks as he may have to offer thereon.

am, Sir,

Your obedient Servant,

BERNARD WAYMOUTH, *Secretary.*

The Surveyor,

Lloyd's Register of Shipping.

R

CIRCULAR No. 589.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

18th February, 1886

WEAR OF CHAIN CABLES.

Sir,

The question of deterioration of Chain Cables by wear has occupied the attention of the Committee; and I am directed to acquaint you that when a chain is found to be worn to an extent which in your opinion renders it inefficient, special care should be taken to examine all its parts, and if Chain Cables are found to be worn, ranging from two-sixteenths to four-sixteenths of an inch or above, according to their sizes, and the owners decline to renew the same, all the circumstances of the case should, without delay, be set forth for the information and determination of the Committee.

I am, sir, your obedient Servant,

B. WAYMOUTH,

Secretary.

No. 488.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

LARGE FORGINGS.

With reference to Notice No. 453, of the 8th December, 1881, on the subject of the inspection of large forgings, intended to be used in the construction of ships or engines proposed to be built under the survey of the Surveyors to this Society, the Committee have recently had under consideration some cases in which, owing to the omission of the Shipbuilders and Engineers to give early intimation to the local Surveyors of the intended manufacture of the forgings, the requisite inspection at the works could not be made by the Society's officers.

The Committee, therefore, think it right, in order to obviate any inconvenience in future, to suggest that in all cases Shipbuilders and Engineers should furnish the local Surveyors with all necessary information *when the orders for such forgings are issued.*

By Order of the Committee,

B. WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

25th January, 1883.

Circular No. 516.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

31st October, 1883.

Sir,

INSPECTION OF FORGINGS.

With reference to Circulars numbered respectively 454 and 480 on the subject of the inspection of forgings, intended to be used in the construction of ships or machinery being built under the survey of this Society's Surveyors, I am directed to request your attention to the following points:—

1. With the view of lessening the delays which occasionally occur in the transmission of the requisite information, and for the convenience of Shipbuilders and Engineers, forms have been prepared for their use in supplying the particulars of forgings ordered by them; and these forms, immediately upon receipt, are to be forwarded by the local Surveyors directly to the officer who will attend to the inspection of the forgings. Although the filling up of the forms will therefore, in future, devolve upon the Shipbuilders and Engineers, it will be the duty of the Surveyors to see that the information is furnished in due course.

2. When the forgings have been inspected, a report should in each case be made out by the inspecting Officer, and, if in all respects satisfactory, should be sent without delay to the Surveyors under whose

survey the forgings will be used ; and this report should be attached to the report on the vessel or machinery, as the case may be, upon the completion of the same. If the result of the inspection is not quite satisfactory, or if no opportunity has been afforded of making the necessary examination, the case must be specially reported to the Committee.

3. As regards Engine forgings, it is considered that the most suitable time for the inspection of shafting is during the operation of rough-turning, and when the shafts are finished. In all cases where the shafts are rough-turned at the forges, the inspection should be made by the Officer whose duty it is to attend there ; but when this operation is conducted at the Engineer's works, the shafting should be examined there by the local Engineer Surveyor under whose inspection the machinery is being constructed, who should make a note to that effect on his report.

4. While the Society's Officers attending forges will thus be relieved of the necessity of inspecting each individual Engine forging while being forged, it is the Committee's wish that they should still keep themselves accurately informed of the practices adopted in the various forges visited, and in the event of objectionable methods of construction coming under notice, the attention of the maker should be drawn thereto, and if this does not effect a satisfactory alteration the case should be fully reported to the Committee.

5. For your information and guidance, I may mention that all forgings (other than Engine forgings which are to be rough-turned at the Engineering works) made on the North-East Coast, should be inspected by Mr. Cameron, the Society's Inspector of Forgings at Sunderland ; those made in the districts of Glasgow and Greenock by Mr. Newcomb, the corresponding Officer stationed at the former port ; and those manufactured in the districts of Liverpool, Hull, Leith, or Dundee, by the respective local Surveyors as hitherto. All intimations concerning forgings to be made in London or in the Midland Counties should be addressed to this office.

6. I have sent to you a supply of the notice forms referred to, which you will be good enough to place in the hands of Shipbuilders and Engineers in your district as may be necessary ; and also some copies of amended forms of Reports on forgings for use in future.

I am, Sir,

Your obedient Servant,

B. WAYMOUTH,

Secretary.

P.S.—In all cases where steel castings are proposed to be used in lieu of forgings, the preliminary form of particulars as well as the report of the examination and tests should be forwarded to the Committee in the first instance.

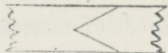
LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, London, E.C.

January 19th, 1886.

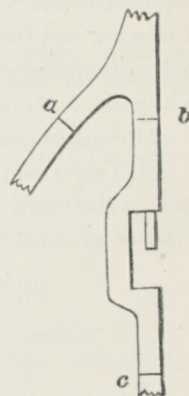
WELDING OF LARGE FORGINGS.

Sir,

The Committee having had under their consideration the subject of the manufacture of Large Forgings for shipbuilding purposes, I am directed to state that from experiments which have been made it has been found that to ensure sound welds in heavy forgings steam hammers should be employed instead of the sledge hammers formerly used; and the welds when of  form should have the V angle not less than 60°. The old plan of screwing the parts together at a welding heat is not found to be satisfactory, especially in forgings of considerable sectional area, and in view of this, in future the welding of forgings exceeding forty square inches in sectional area will be required by the Committee to be done with steam hammers.

It has been the practice in some works to place the "shut" of the lower part of a stern frame in the sole piece. This is considered to be very objectionable; and the Surveyor should inform manufacturers that the welding should be placed in the lower part of the posts in all cases, and that such connections in the sole piece will not be sanctioned. In Rudder frames the welds of the upper part of the frame to the main piece should not be placed close together as indicated in the sketch at *a, b*; but should be arranged so as to be well clear of each other as indicated by *a, c*.

In cases where stern frames or rudders are taken out of vessels to be repaired, the Surveyors should furnish full particulars of the defects observed, including a sketch showing the position and nature of the fracture on the Report, for the information of the Committee, so that a record may be kept in this office of all failures in such forgings.



I am, Sir, your obedient servant,

B. WAYMOUTH,

Secretary.

CIRCULAR No. 536.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL MAST CAPS.

SIR,

In reference to the use of cast steel mast caps, I am directed to inform you that the Committee of this Society will be prepared to admit of such steel mast caps being fitted to vessels intended to be classed in the Register Book on the following conditions:—

It is requisite that builders proposing to use cast steel mast caps shall, in the first instance, state the name of the firm by whom the caps are to be made, in order that the Committee may be satisfied that the manufacturers have proper facilities for making steel caps of a satisfactory quality.

With this object, the manufacturers will be required to give notice to the Committee when an opportunity can be afforded to the Society's surveyors to attend at the works, in order to report upon the appliances in use and the processes of manufacture, and also to ascertain by crucial tests that the material of which the caps are proposed to be made is of good and ductile quality.

Upon a favourable report being received from the Surveyors, after the inspection of the works of a manufacturer, the Committee will sanction the use of caps of his manufacture, provided test pieces be cast on the caps of sufficient size, to enable the Surveyors to subject the same to such tests as they may deem necessary, in order to satisfy themselves that the material is of good quality. The caps also are to be suspended and severely hammered in the presence of the Surveyors to ensure that the casting is sound in each case.

I am, your obedient servant,

B. WAYMOUTH, *Secretary*.

2, White Lion Court, Cornhill, E.C.,
6th November, 1884.

CIRCULAR No. 594.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

QUALITY OF IRON.

2, White Lion Court, Cornhill, London, E.C.

27th April, 1886.

SIR,

The Committee's notice having been drawn to the subject of the extremely low price of Iron at the present time, and to the consequent possibility of some of the Iron now manufactured being of inferior quality, I am directed to request your special attention to the circular letter (No. 498), which was issued to the Society's Surveyors on the 31st May, 1883, in reference to the quality of iron for shipbuilding, and to impress on you the importance of a close observance of the instructions contained therein.

The Committee, with special regard to existing circumstances, will be glad to be furnished with any remarks you have to offer on the quality of iron now supplied for shipbuilding.

I am, Sir, your obedient servant,

B. WAYMOUTH, *Secretary*.

NOTICE.—No. 614.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ALTERATIONS AND AMENDMENTS MADE IN THE RULES OF THE SOCIETY BY THE GENERAL COMMITTEE.

Paragraph 6 of Section 13 of the Rules for Iron Vessels has been amended to read as follows:—

6. It is recommended that the round-up of the beams of all weather decks should not be less than one quarter of an inch per foot of length of beam. In the case of awning-decked steamers, this amount of round-up will be assumed in determining the minimum freeboard, which is required for insertion in the Register Book. And in all other cases where a freeboard is assigned by the Committee, the same round of beam will be assumed in determining the same.

CHARGES FOR INSPECTION OF FORGINGS.

The following scale of charges has been approved by the General Committee for the inspection of forgings for other than new vessels:—

SHIP FORGINGS OR CASTINGS.

For vessels not exceeding 600 tons	...	...	...	£2	2	0
„ over 600 tons but not exceeding 1600 tons...				3	3	0
„ over 1600 tons	...	...	...	4	4	0

ENGINE FORGINGS OR CASTINGS.

For shafts up to 12 inches in diameter	...	...	...	£1	1	0
„ over	„	„	...	2	2	0

These fees to be chargeable for the inspection of the whole or any portion of shafting which is not being forged and finished at the works where the engines are being made under the survey of the Society's Officers, and when more than two visits are necessary, to be increased.

N.B.—Travelling expenses are to be charged in the case of both old and new vessels.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.

16th December, 1886.

(See Notice No. 620.)

No. 620.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHARGES FOR INSPECTING CASTINGS OR FORGINGS AS SET
FORTH IN NOTICE No. 614.

In order to obviate misunderstanding arising in regard to the responsibility for the Payment of the Fees recently approved by the Committee of this Society for the Inspection of castings or Forgings, NOTICE IS HEREBY GIVEN that the charges in question, including travelling expenses, will be payable by the Forge or other Company by whom the forgings or castings are made.

By order of the Committee,

B. WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
22nd February, 1887.

No. 635.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

DEAR SIR,—I beg to draw your attention to the following extract from the Society's Rules regarding the Special Periodical Surveys of Iron and Steel Vessels classed in the Society's Register Book.

You will observe upon reference to the last paragraph of the extract that unless the conditions set forth are complied with, the word "Expired" will be inserted against a vessel's character in the Register Book.

I am, Dear Sir,

Yours faithfully,

B. WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
30th August, 1887.

EXTRACT FROM THE RULES, 1887-88.

To entitle IRON AND STEEL VESSELS to retain the Characters assigned to them in the Register Book they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3 respectively.

The periods at which these surveys are intended to be held, in the case of vessels classed from 100A to 90A inclusive, are when a vessel is 4 years, 8 years, and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching; but when the first entry survey is not completed within that period then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 survey.

Similarly, vessels classed 85A and under must be subjected to a special survey every three years, as per Nos. 1, 2, and 3, and afterwards as per Nos. 1, 2, and 3, consecutively.

In any case in which it may suit the convenience of the Owners, the special surveys Nos. 1 and 2 may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due, before leaving the United Kingdom, the word "Expired" will be inserted against her character in the Register Book; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special Surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

N.B.—In order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage or from other causes, rests with the Owners, Masters, or Agents.

No. 636.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

DEAR SIR,—I am directed to draw your attention to the fact that it is a condition of the classification of vessels by this Society that all Repairs of Ships or their Machinery that may be required at ports where there is a Surveyor to the Society, in order to the vessels retaining their characters in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor.

As the non-observance of this requirement in the case of vessels requiring repairs of damage, &c., at ports abroad has in some instances occasioned inconvenience to Owners, as well as expense of further surveys, I would venture to suggest the advisability of your giving instructions to the Masters of your vessels and to your Agents abroad, in all cases where surveys are required consequent upon damage or otherwise, to call in the Society's local Surveyor to hold such surveys, in order that the vessels' character in the Register Book may be duly maintained.

I may point out that, besides complying with the requirements of the Rules of this Society for the continuance of the classification of vessels, surveys held by the Society's Surveyors abroad will also serve all the purposes of Consular Surveys, which, being, as you are aware, *purely optional*, will not then be necessary.

I am, Dear Sir,

Yours very truly,

B. WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.
30th August, 1887.

No. 647.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL ANCHORS.

NOTICE IS HEREBY GIVEN that the Committee of this Society will hereafter require that all Cast Steel Anchors intended for vessels classed or proposed to be classed in the Society's Register Book shall be subjected, in addition to the statutory tests, to the percussive, hammering, and bending tests recommended in the recent report of the Committee appointed by the Board of Trade to consider the question of tests of Cast Steel Anchors.

These tests, which are hereunder set forth, must be carefully and completely made in the presence and to the satisfaction of officers appointed by the Committee, viz. :—

PERCUSSIVE TEST.

1. Anchors, or when anchors are made of more than one piece, each piece, shall be subject to this test, as follows :—

GIVEN WEIGHT.	GIVEN HEIGHT.	The anchor or piece shall be raised the given height for the given weight and shall be dropped on an iron slab.
15 cwt. and below	- 15 feet.	The given height means that the lowest part of the anchor or piece when suspended shall be at least the given height above the iron slab on to which it is to be dropped.
Above 15 cwt.	- 12 feet.	

2. An anchor of the Admiralty pattern shall first be raised vertically to the given height with its shanks and arms in a horizontal position, and shall be let fall from that height.

3. It shall then be raised a second time to the given height, and shall be suspended with the crown downwards. Two iron blocks shall be placed underneath it, and it shall be let fall from this position so that one of the blocks receives it on the middle of one arm, and the other block receives it on the middle of the other arm.

4. The slab for the horizontal test shall be of steel or iron, well laid on a solid concrete foundation to the satisfaction of the inspector.

5. If the slab on which the anchor falls is broken, the test shall be repeated until a slab is made that does not break.

6. The blocks for the vertical test shall be solid, and shall be of sufficient height to prevent the

crown of the anchor from touching the slab, and shall be otherwise to the satisfaction of the inspector.

HAMMERING TEST.

7. When the percussive test has been passed successfully, to the satisfaction of the inspector, the anchor or piece shall be slung and freely put to a hammering test as follows, that is to say, it shall be well hammered over its parts with a sledge hammer weighing not less than 7 lbs., and shall be required to give under this treatment such a clear ring in all its parts as shall satisfy the inspector that the casting is sound, and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

BENDING TEST.

8. Cast steel may be passed as sufficiently ductile for anchors when a piece of each casting, 8 inches in length, is cut from the casting, turned to 1 inch in diameter, and is then bent cold by hammering through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, without showing signs of flaw or fracture.

9. There must be a piece cast on each cast steel anchor, or on each portion of such anchor when it is made of more than one casting, and such piece must be of sufficient size to enable one test piece of the size before stated to be cut out of it, or it may be (at the discretion of the manufacturer) of sufficient size to enable four test pieces to be cut out of it. If it is only of sufficient size to enable one test piece to be cut out of it, that piece shall be subjected to the bending test named in paragraph 8, and, if it fails to withstand it, the casting is to be condemned.

If the piece is large enough to enable four test pieces to be cut out of it, these four test pieces shall be disposed of as follows, that is to say, one of them shall be turned in a lathe to 1 inch in diameter for a length of 8 inches, and bent cold through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, and if it withstands this test without flaw or fracture, shall be deemed to have withstood a satisfactory test for ductility. If the one test piece does not pass this test, all or any of the other three test pieces may be tested in a similar manner, and if any one of the four test pieces passes this test, the anchor or part of the anchor, as the case may be, shall be deemed so far satisfactory.

ANNEALING.

10. Each anchor must be properly, and sufficiently annealed, and, when so annealed, shall be stamped "annealed steel." Annealing is not to be regarded as proper, or efficient, unless the process extends from three days for small anchors, up to six days for large ones.

By Order of the Committee,

B. WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.,

10th November, 1887.

CIRCULAR, No. 662.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

VESSELS CLASSED IN THE LATE UNDERWRITERS' REGISTRY FOR IRON VESSELS.

Sir,—I am directed to remind you that the following requirements of the Sixth Periodical Survey set forth in the Rules of the late Underwriters' Registry for Iron Vessels have to be complied with in the case of vessels classed by that Society :—

SIXTH SURVEY OR SPECIAL SURVEY.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

In pursuance of the foregoing requirements I have to state that, for the information of the Committee in dealing with the classification of vessels which have to pass this survey, the scantlings, when ascertained in the manner directed are to be submitted on a first entry form of report, and compared therein with the requirements of the Rules of the late Underwriters' Registry for 1884-85. A profile sketch is at the same time to be furnished, showing the positions in which the drilling of the shell plating has been made, and also the thickness of the plating on both sides of the vessel.

When, in the case of a vessel which has been classed in both Registries, the Sixth Survey is held in conjunction with the Special Survey No. 3, the fee charged should be increased proportionately so as to cover the additional labour involved in the Sixth Survey.

I am, Sir,

Your obedient Servant,

B. WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

23rd February, 1888.

NOTICE.—No. 673.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

BUNKERS OF IRON AND STEEL SHIPS.

Sir,—The attention of the Committee has recently been drawn to the case of a steel steamer, in which the framing, stringers and beam ends in the Coal Bunker space had almost wasted away through corrosion after a period of only 8 years, during which time, however, it would appear that the vessel inside the bunkers had never been painted.

I am directed to acquaint you that, in view of the above, more than ordinary care is required in surveying bunkers; and you are to draw the attention of owners to the advantage of thoroughly coating such parts with some good preserving composition, such as Stockholm tar sprinkled with Portland cement, or best black varnish—put on the surfaces when clean and dry—in preference to the use of ordinary paint, more particularly in steel vessels in which the scantlings are less than in those built of iron.

I am, Sir,

Your obedient Servant,

B. WAYMOUTH,

Secretary.

2, White Lion Court, Cornhill, London, E.C.

5th May, 1888.

No. 676.

LLOYD'S REGISTER OF BRITISH & FOREIGN SHIPPING

RECORD OF "EX STEAMER."

With reference to the practice of recording "ex-Steamer" in the Register Book after the names of sailing vessels that have originally been steamers,

Notice is hereby given, that the Committee, who recently had the subject under consideration, have resolved that this practice is to be continued.

The Committee, however, will be prepared to consider representations that may be made to them in regard to sailing vessels that were formerly auxiliary steamers, with a view to determining whether or not the record in question is to be made in the case of such vessels.

By order of the Committee,

B. WAYMOUTH, *Secretary.*

2, *White Lion Court, Cornhill, E.C.*

7th June, 1888.

LLOYD'S REGISTER OF BRITISH & FOREIGN SHIPPING

RECORD OF "EX STEAMER"

With reference to the question of retaining "EX STEAMER" in the Register Book after the name of sailing vessels that have originally been registered.

Notice is hereby given, that the Committee, who recently had the subject under consideration, have resolved that this question is to be decided.

The Committee, however, will be prepared to consider representations that may be made in regard to sailing vessels that were formerly registered with a view to determining whether or not the word in question is to be added in the case of such vessels.

By order of the Committee

R. WATKINS, Secretary

2, R. W. Lane, London, E.C.

1st June 1900

KEY TO THE REGISTER.

1888—89.

KEY TO SYMBOLS OF CLASSIFICATION IN REGISTER BOOK.

CLASSIFICATION OF LLOYD'S REGISTER.

*A1	Character of Iron vessels built with thicker plating than the Rules <i>now</i> require.
A1 A1 A1	Characters of Iron ships built according to the Rules of the Society in force between the years 1864 and 1871.
A1	Without a numeral prefixed, character of Iron vessels built for a special purpose.
100A1 95A1 } 90A1 85A1 } 80A1 75A1 }	Characters of ships built of Iron or Steel according to the Rules of the Society for Iron ships since 1869.
A 1	Character of Wood or Composite ships of the first class well and sufficiently equipped. The figures in column 13 indicate the term of years assigned originally or on continuation on the character A.
A 1	Character of ships which have passed period assigned on original Survey, or Continuation, or Restoration, and of ships, not having an original Character, which are found to be fit to carry dry and perishable goods to and from all parts of the world.
Æ 1	Character of ships fit for conveyance of dry and perishable goods on short voyages, and cargoes not in their nature subject to sea damage on any voyage.
E 1	Character of ships which have been found on survey fit for the conveyance of cargoes not in their nature subject to sea damage on any voyage.
1 F 2 F	Characters assigned to Foreign Built Ships—now discontinued.

The figure 1 affixed to a character signifies that the vessel is well and sufficiently equipped. A line after the A (thus, A— signifies that the equipment is deficient from that required by the Rules.

A ring over the figure 1, thus Φ , indicates defects in the masts or rigging of a Sailing ship imperilling the vessel's safety.

A red ring over the figure 1, thus $\textcircled{1}$ indicates defects in the engines and boilers of a steam ship imperilling the vessel's safety.

CLASSIFICATION OF THE UNDERWRITERS' REGISTRY.

A1*, A1* Characters of Iron or Steel Vessels built in excess of the Rules and of extra quality of Iron.

A1*, A1*; A1, A1; A, A Characters of Iron, Steel, or Composite Vessels built according to the Rules. Vessels classed in Red have been built under the inspection of the Surveyors to the Liverpool Registry.

The figure 1 or 2 affixed to Symbols of Classification signifies the Character of Equipment.

The figures in the fifteenth Column represent the mean drafts corresponding to an immersion of 65, 70, 75, and 80 per cent. respectively, as assigned by the Underwriters' Registry, but these drafts do not indicate approved load lines.

All vessels are required to be surveyed periodically. The *date of Survey* only certifies to their state of efficiency *at that time*.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE of PERIODICAL SURVEYS required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.

ABBREVIATIONS (*Alphabetically arranged*), AND SIGNS.

Abbreviation or Sign.	No. of Col. in Register Book.	Signification.	Abbreviation or Sign.	No. of Col. in Register Book.	Signification.
		A.			
a, or a† ...	13	Equipment letter, as per Table No. 22.	Asp.	2	Asphalted.
(a)	7	Shell, end plates, furnaces and combustion chamber of boiler made of steel; stays of iron.	<i>Awning</i>	2&3	Built according to the Rules for Awning Decked vessels. Section 43. See Fig. 8 of Illustrations of Types of Vessels following KEY to REGISTER.
A.	7	Ash (timber).			B.
A.&C.P. ...	12	Anchor and Chains proved at a Public Machine recognised by the Committee of LLOYD'S REGISTER. See Table No. 22.	b, or b† ...	13	Equipment letter, as per Table No. 22.
Alm. rb. ...	7	Almost rebuilt,—with date of the work.	(b)	7	Shell, stays and end plates of boiler made of iron; furnaces and combustion chamber of steel.
Alt.	7	Altered, with date.	B.B.	7	Black Birch (timber).
A.P.	12	Anchor proved at a Machine recognised by the Committee of LLOYD'S REGISTER. See Table No. 22.	Bh.	7	Beech (timber).
A.P.T. ...	10	After Peak Tank. See Illustration following KEY to REGISTER.	B.D.	5	Bridge Deck. See Illustrations of Types of Vessels following KEY to REGISTER.
			B.Hds. ...	2	Bulkheads, with number of same prefixed.

A List of Surveying Ports will be found at the end of the KEY to REGISTER.

KEY TO ABBREVIATIONS AND SIGNS—continued.

Abbreviation or Sign.	No. of Col. in Register Book.	Signification.	Abbreviation or Sign.	No. of Col. in Register Book.	Signification.
B.&M.S.	7	Boilers and Machinery Surveyed, with date, denoting that the Boilers and Machinery, though not fitted strictly in accordance with the Rules, were found, upon inspection at that time, to be in good condition.			D.
B.S.	7	Boilers Surveyed, with date, denoting that the Boilers were found, upon inspection at that time, to be in good condition.	<i>d</i> , or <i>d</i> †... 13		Equipment letter, as per Table No. 22.
B.S. 10		Subject to Biennial Survey.	(<i>d</i>) 7		Shell and end plates of boiler made of steel; stays, furnaces, and combustion chamber of iron.
Bk. 2		Bark (Barque).	<i>d</i> 2		Doubled with Wood.
Bkn. 2		Barkentine (Barquentine).	<i>D</i> 7		Diagonal Engines.
Bg. 2		Brig.	<i>D.B.</i> 10		Double Bottom. See Illustration following KEY to REGISTER.
Bn. 2		Brigantine.	<i>D B.a.</i> ... 10		Double Bottom, aft. See Illustration following KEY to REGISTER.
Brk. 5		Break Deck. (See <i>R.Q.D.</i> in Figs. 4 and 6 of Illustrations of Types of Vessels following KEY to REGISTER.)	<i>D.B.f.</i> ... 10		Double bottom, forward. See Illustration following KEY to REGISTER.
		C.	<i>D.B.</i> 10		Double bottom under Engines and Boilers. See Illustration following KEY to REGISTER.
<i>c</i> , or <i>c</i> † ... 13		Equipment letter, as per Table No. 22.	<i>under</i> <i>E. & B.</i>		
(<i>c</i>) 7		Shell and stays of boiler made of iron; end plates, furnaces and combustion chamber of steel.	<i>dd</i> 7		Decks Doubled.
<i>C</i> 2		Sheathed with Copper.	<i>D. F. & S.</i>		Decks Felted and Sheathed.
<i>Cr.</i> 7		Cedar (timber).	<i>dia.d.</i> ... 2		Bottom diagonally doubled with Wood.
<i>Chs.</i> 7		Chestnut (timber).	<i>Dks.</i> 2&3		Decks, with number prefixed thus, 2 <i>Dks.</i>
<i>C.</i> 7		Compound Engines.	<i>2Dks (Iron)</i> 2&3		2 Decks of Iron, (or Steel).
<i>C.</i> 13		Placed before figures signifies the number of years for which the Vessel had been Continued.	<i>or (Steel)</i>		
			<i>2Dks (Iron</i>	2&3	2 Decks of Iron, the Upper one being sheathed or covered with wood.
			<i>-Uws)</i>		
C.B. 2		Fastened with Copper or Yellow Metal Bolts, as per paragraph No. 3, Section 46 of Rules for Wood Ships.	<i>Dr.</i> 2		Dogger (rig).
<i>c.f.</i> 2		Fastened with Copper or Yellow Metal bolts, as per paragraph No. 1 in Section 46 of Rules for Wood Ships.	<i>drp.</i> 7		Damage repairs to Ship.
C.F. 2		Fastened with Copper or Yellow Metal bolts, as per paragraph No. 2 in Section 46 of Rules for Wood Ships. Also for Copper or Yellow Metal fastenings of Composite ships, as per paragraph No. 1, page 129.	drp	7	Damage repairs to Machinery.
C.F. ... 2		Fastened with Copper or Yellow Metal bolts for Composite ships, as per paragraph No. 2, page 129.			E.
C.P. 12		Chains proved at a Public Machine recognised by the Committee of LLOYD'S REGISTER. See Table No. 22.	<i>e</i> 13		Equipment letter, as per Table No. 22.
<i>Cell. DB.</i> 10		Cellular construction of Double Bottom. See Illustration following KEY to REGISTER.	(<i>e</i>) 7		Shell of boiler made of steel; stays, end plates, furnaces, and combustion chamber of iron.
Cem. 2		Cemented.	<i>E.</i> 7		Elm (timber).
Cl. 7		Clincher (build).	<i>E.</i> 14		See SYMBOLS OF CLASSIFICATION at the beginning of KEY to REGISTER.
<i>Cmp.</i> ... 7		Engines altered to Compound, with date thereof.	<i>Ex</i>		Experimental.
Comp. 2		Composite (build).	<i>Expl. B.S.</i> 10		Vessels built experimentally and classed subject to Biennial Survey.
Cont. 11		Continued. With the name of Port of Survey and Date, also number of years for which the vessels are Continued on the Character A (thus, Cont.Lon. Dec.86-8 years).	<i>Expl. T.S.</i> 10		Vessels built experimentally and classed subject to Triennial Survey.
					F.
Ctr. 2		Cutter.	<i>f</i> 13		Equipment letter, as per Table No. 22.
Cy. 7		Cylinders, with number of same prefixed. The figures after Cy. represent diameter of cylinders and length of stroke in inches.	(<i>f</i>)..... 7		Shell of boiler made of iron; stays, end plates, furnaces, and combustion chamber of steel.
			<i>F.</i> 2		Felt.
			<i>F.</i> ... 7		Fir (timber).
			<i>F.</i> 5		Forecastle. See Illustrations of Types of Vessels following KEY to REGISTER.
			<i>F.D.</i> 5		Flush Deck. See Fig. 1 of Illustrations of Types of Vessels following KEY to REGISTER.
			<i>F.P.T.</i> ... 10		Fore Peak Tank. See Illustration following KEY to REGISTER.
			<i>F & d</i> ... 2		Bottom felted and doubled with wood.
			<i>F & dia. d.</i> 2		Bottom felted and diagonally doubled with wood.
			<i>F.&Y.M.</i> 2		Sheathed with Yellow Metal over Felt.
			<i>F.S.</i> 10		Full Scantlings, carried to upper deck.
			<i>F.S. & Awning dk</i> 10		Full Scantlings, carried to the deck below Awning deck.

List of Surveying Ports will be found at the end of the KEY TO REGISTER.

KEY TO ABBREVIATIONS AND SIGNS—continued.

Abbreviation or Sign.	No. of Col. in Register Book.	Signification.	Abbreviation or Sign.	No. of Col. in Register Book.	Signification.
G.					
<i>g</i>	13	Equipment letter, as per Table No. 22.	len.	7	Ship lengthened.
(<i>g</i>)	7	Shell and end plates of boiler made of iron; stays, furnaces, and combustion chamber of steel.	LA.&CP. ...	12	Anchors and Chains proved at a Machine under the Superintendence of the Committee of LLOYD'S REGISTER. See Table No. 22.
<i>G</i>	2	Galliot.	L.M.C. 7or8		Lloyd's Machinery Certificate, with date, denoting that the Machinery and Boilers are fitted in accordance with the Rules, and found at the time mentioned in good condition.
<i>G</i>	7	Gum (timber).	*L.M.C. 7or8		Special Survey of Machinery during construction by the Engineer-Surveyors to LLOYD'S REGISTER.
<i>Ght</i>	7	Greenheart (timber).	Lr.	2	Lugger.
<i>G.I.B.</i> ...	2	Fastened with Galvanised Iron Bolts.	lrp.	7	Large repairs to Hull of Ship.
H.			lrp	7	Large repairs to Machinery.
<i>h</i>	13	Equipment letter, as per Table No. 22.	L.v.	13	Classification of the Liverpool Underwriters Registry.
(<i>h</i>)	7	Shell, end plates, furnaces, and combustion chamber of boiler made of iron; stays of steel.	M.		
<i>H</i>	2	Hoy (rig).	<i>m</i>	13	Equipment letter, as per Table No. 22.
<i>H</i>	7	Horizontal Engines.	(<i>m</i>).....	7	Shell of boiler made of iron; screw stays of steel; longitudinal stays of iron; remainder partly of steel, partly of iron.
<i>H</i>	5	House on Deck.	<i>M</i>	7	Mahogany (timber).
<i>Hk</i>	7	Hackmatack (timber).	M.S. 7or8		Machinery Surveyed, with date, denoting that the Machinery, though not fitted strictly in accordance with the Rules, was found, on inspection at that time, to be in good condition.
<i>Hm</i>	7	Hemlock (timber).	<i>M.T.</i> ...	10	Midship deep Tank. See Illustration following KEY to REGISTER.
<i>HP</i>	7	Horse Power, according to ship's official register.	Mat.	7	Materials, with number of years prefixed, indicates the different grades of Wood used in ship's construction, as per Table A.
<i>H.T.</i>	11	Half Time or Intermediate Survey held. (Section 34.)	N.		
I.			<i>n</i>	13	Equipment letter, as per Table No. 22.
<i>i</i>	13	Equipment Letter, as per Table No. 22.	(<i>n</i>)	7	Shell of boiler made of iron; stays of steel; remainder partly of steel, partly of iron.
(<i>i</i>)	7	Shell, stays, end plates, furnaces, and combustion chamber of boiler made of iron.	N.B.	7	New Bottom.
<i>I.B.</i>	2	Fastened with Iron Bolts.	N.B.	7	New Boilers.
(<i>Iron</i>).....	2	Iron—material of Decks.	*N.B. 7		New Boilers specially Surveyed during construction.
J.			N.D.	7	New Deck.
<i>j</i>	13	Equipment letter, as per Table No. 22.	N.E.	7	New Engines.
(<i>j</i>)	7	Shell and stays of boiler made of iron; remainder partly of steel, partly of iron.	N.E.&B. 7		New Engines and Boilers.
<i>J</i>	7	Juniper (timber).	*N.E.&B. 7		New Engines and Boilers, which have been specially Surveyed during construction.
K.			Nkl.	7	New Keel.
<i>k</i>	13	Equipment letter, as per Table No. 22.	Nklsn. ...	7	New Keelson.
(<i>k</i>)	7	Shell and stays of boiler made of steel; remainder partly of steel, partly of iron.	NTsds. ...	7	New Topsides.
<i>K</i>	2	Ketch.	NW.	7	New Wales.
L.			O.		
<i>l</i>	13	Equipment letter, as per Table No. 22.	<i>o</i>	13	Equipment letter, as per Table No. 22.
(<i>l</i>)	7	Shell of boiler made of steel; stays of iron; remainder partly of steel, partly of iron.	(<i>o</i>)	7	Shell, screw stays, end plates, furnaces, and combustion chamber of boiler made of steel; longitudinal stays of iron.
<i>L</i>	7	Locust (timber).			
<i>Lh</i>	7	Larch (timber).			
<i>LO</i>	7	Live Oak (timber).			
<i>L</i>	7	Lever Engines.			
<i>lb</i>	7	(With figures prefixed). Boiler Pressure in pounds per square inch.			

KEY TO ABBREVIATIONS AND SIGNS—continued.

Abbreviation or Sign.	No. of Col. in Register Book.	Signification.	Abbreviation or Sign.	No. of Col. in Register Book.	Signification.
O.	7	Oscillating Cylinders.	Scw.	2	Screw.
O.	7	Oak (timber).	Stm.	2	Steamer.
O.M.	7	Old materials used in ship's construction.	Sk.	2	Smack.
			Sp.	2	Sloop.
		P.	Sq.	2	Square Rigged.
p.	13	Equipment letter, as per Table No. 22.	Sr.	2	Schooner.
(p).....	7	Shell and longitudinal stays of boiler made of iron ; screw stays, end plates, furnaces and combustion chamber of steel.	Sw.	2	Snow.
P.	7	Pine (timber).	s.c.	7	Surface condensing.
P.B.H. ...	2	Partial Bulkhead, or Bulkhead not reaching to the Main Deck.	Shude dk.	2&3	Deck of light construction and with openings in sides. See Fig. 7 of Illustrations of Types of Vessels following KEY TO REGISTER.
PP.	7	Pitch Pine (timber).	Spar dk.	2&3	Built according to Rules for Spar-Decked Vessels. Section 42. See Fig. 9 of Illustrations of Types of Vessels following KEY TO REGISTER.
P.	5	Poop Deck. See Illustrations of Types of Vessels following KEY TO REGISTER.	srp.	7	Some repairs to Hull of ship.
plk.	7	Plank	s.s.	10	Special Survey of Iron or Steel ships.
pt.	2	Part.		&	Vessels submitted to Periodical Surveys, as prescribed in the Rules for Iron Ships (thus, s.s.Nwc. No.1-86 ; s.s. Hull No.2-86 ; s.s.Lon. No.3-86).
ptOM. ...	7	Part Old Materials used in ship's construction.	S.S.	11	Special Survey of Composite ships, with date, as per Section 43 of the Rules.
Pad.	7	Paddle Steamer.	S.S.	10	Special Survey of Wood ships classed
		Q.		&	A or E, with the term of years granted them, and the year of Survey, as per Sections 61, 63, and 65 of Rules for Wood Ships (thus, SS. Whn.86-4yrs.).
q.	13	Equipment letter, as per Table No. 22.		11	Special Survey. Date in red affixed denotes that the vessel has been surveyed at that time in accordance with the Rules for Wood Ships, Section 60, and the number of years indicates the term for which the vessel remains on this character (thus, S.S.Sld.86-5yrs.)
(q)	7	Shell, longitudinal stays, end plates, furnaces, and combustion chamber of boiler made of iron ; screw stays of steel.	S. S.	11	Special Survey.
Q.	7	Quadruple expansion engines.		&	denotes that the vessel has been surveyed at that time in accordance with the Rules for Wood Ships, Section 60, and the number of years indicates the term for which the vessel remains on this character (thus, S.S.Sld.86-5yrs.)
Qpd.	7	Engines altered to Quadruple expansion, with date.		12	Steel, —material of Decks.
		R.	(Stl.)	2	
r.	13	Equipment letter, as per Table No. 22.			T.
(r)	7	Shell, longitudinal stays, end plates, furnaces, and combustion chamber of boiler made of steel ; screw stays of iron.	t.	13	Equipment letter, as per Table No. 22.
Rest.	11	Restored. Thus, Rest.Lon.86-5 yrs., denotes that the vessel was restored on the A character for 5 years from 1885, and that the Survey was held at London.	(t)	7	Shell, screw stays, end plates, furnaces, and combustion chamber of boiler made of iron ; longitudinal stays of steel.
retrld. ...	7	Re-treenailed.	T.	7	Teak (timber).
Roof	3	Vessel built under a roof, as per Section 48 of Rules for Wood Ships.	T.	7	Triple expansion engines.
RP.	7	Red Pine (timber).	Tam.	7	Tamarac (timber).
R.Q.D. ...	5	Raised Quarter Deck. See Figs. 4 and 6 of Illustrations of Types of Vessels following KEY TO REGISTER.	tr.B.	2&3	Tiers of Beams with number of same prefixed (thus 3tr. E.).
		S.	t.s.	10	With a date denotes that the vessel has been submitted to Triennial Survey, as prescribed by Rules for Iron Ships (thus, "t.s. 86").
s.	13	Equipment letter, as per Table No. 22.	Tpd.	7	Engines altered to Triple Expansion, with date.
(s)	7	Shell, stays, end plates, furnaces, and combustion chamber of boiler made of steel.			U.
s.	2	Sheathed with Wood.	u.	13	Equipment letter, as per Table No. 22.
S.	7	Spruce (timber).	U.M.	2	Sheathed with Union Metal.
Sb.	7	Sabieu (timber).	U.	2	Upper deck.
Sl.	7	Saul (timber).	U-ws. ...	2	Upper deck sheathed or covered with wood.
Salted ...	3	Vessels salted in accordance with Rules. Section 37.			
Salted† ...	3	The dagger signifies that the vessel's beams have not been salted.			
S.	2	Ship.			

A List of Surveying Ports will be found at the end of the KEY TO REGISTER.

KEY TO ABBREVIATIONS AND SIGNS—*continued.*

Abbreviation or Sign.	No. of Col. in Register Book.	Signification.	Abbreviation or Sign.	No. of Col. in Register Book.	Signification.
		V.			SIGNS, &c.
<i>v</i>	13	Equipment letter, as per Table No. 22.	✚	1, 13	Ships built under Special Survey.
		W.	✚	8	Machinery built under Special Survey.
<i>w</i>	13	Equipment letter, as per Table No. 22.	✚ NE & B.	7	New Engines and Boilers built under Special Survey.
<i>WB</i> = ..	10 & 11	Water Ballast, with particulars. (See illustration following KEY.)	+	3	Following word <i>salted</i> signifies that the vessel's beams have <i>not</i> been salted.
<i>Well deck</i>	2	A Well decked Steamer is one having a fore-castle, and a long raised quarter deck or a poop joined to a bridge house, thus leaving the main deck exposed between the bridge front and the end of the fore-castle. See Figs. 5 and 6 of Illustrations of Types of Vessels following KEY to REGISTER.	—	14	Vessel at date mentioned, from reported defects, was not entitled to a character in Register Book.
			5, 86	14	Vessel's class withdrawn from non-compliance at date mentioned with the Society's Rules.
<i>W.F. & d</i>	7	Wales felted and doubled with Wood.	...	13	Vessel's class withdrawn at Owner's request.
<i>W.F. & diad</i>	7	Wales felted and diagonally doubled with Wood.	— (after character)	14	Equipment of vessel deficient either in quality or quantity.
<i>W.F. & s...</i>	7	Wales felted and sheathed with Wood.	1	14	The figure 1 placed after a character signifies that the vessel is well and sufficiently equipped, as per Table No. 22.
<i>W.O.</i>	7	White Oak (timber).	⊕	14	A black ring over the figure 1 indicates defects in Masts or Rigging imperilling the ship's safety.
<i>W.S.</i>	2	Sheathed with Wood (relating to Decks).	Ⓛ	14	A red ring over the figure 1 indicates defects in Engines or Boilers of a steam ship imperilling the ship's safety.
<i>W.S.</i>	7	Wales sheathed with Wood.		5	Two or three Decks laid.
		X.	2 or 3 <i>Dks</i>	5	Two or three tiers of Beams, with or without Decks on them.
<i>x</i>	13	Equipment letter, as per Table No. 22.	2 or 3 <i>tr.B.</i>	5	Built according to the Rules for Three-Decked Vessels, Section 41.
		Y.			
<i>y</i>	13	Equipment letter, as per Table No. 22.			
<i>Y.M.</i>	2	Sheathed with Yellow Metal.			
<i>Y.P.</i>	7	Yellow Pine (timber).			
<i>Yt.</i>	2	Yacht.			
		Z.			
<i>z</i>	13	Equipment letter, as per Table No. 22.			
<i>Z</i>	2	Sheathed with Zinc.			

The Figures under a Character denote the date when the Vessel was last Surveyed.

The twelfth, thirteenth, and fourteenth Columns left blank, indicate that the Vessel has never been Classed in the Register Book.

The Figures in the thirteenth column, to vessels in the classes A in red, Æ or E class, imply that they were originally classed A for that number of years.

When the fourteenth column is left blank except as regards the date of Survey last recorded, it indicates that the Character has expired or been withdrawn from absence of Survey, or on account of non-payment of fee due in the case.

KEY TO ABBREVIATIONS.

Illustrations or Notations in the Tenth Column of the Register Book, in regard to Double Bottoms and Water Ballast Tanks :—

DB.70ft.80tons : denoting Double Bottom 70 feet long ; capacity, 80 tons.

DB.a.58ft.f.40ft.180tons : denoting Double Bottom, aft 58 feet, forward 40 feet long ; total capacity 180 tons.

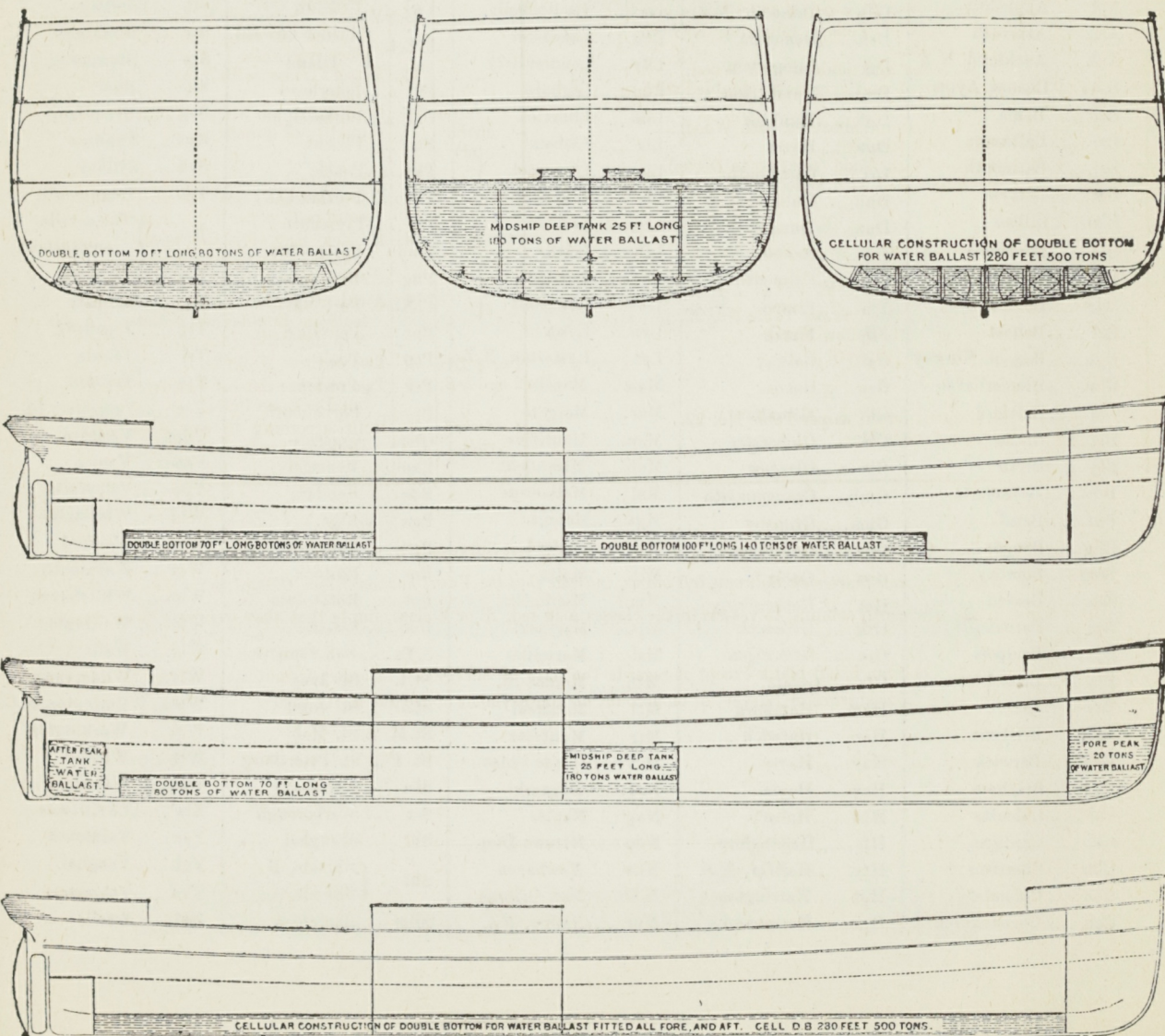
DB.a.72ft.&under E.&B.28ft.260tons : denoting Double Bottom aft 72 feet long, and under Engines and Boilers 28 feet long ; total capacity, 260 tons.

Cell.DB.280ft.500tons : denoting cellular construction of Double Bottom 280 feet long ; capacity, 500 tons.

F.P.T.20tons : denoting Fore Peak Tank ; capacity, 20 tons.

A.P.T.8tons : denoting After Peak Tank ; capacity, 8 tons.

M.T.25ft.180tons : denoting Midship deep Tank, 25 feet long ; capacity, 180 tons. See Diagrams.



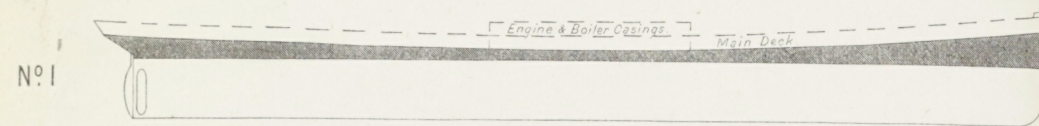
KEY TO ABBREVIATIONS OF SURVEYING PORTS

In the Twelfth Column.

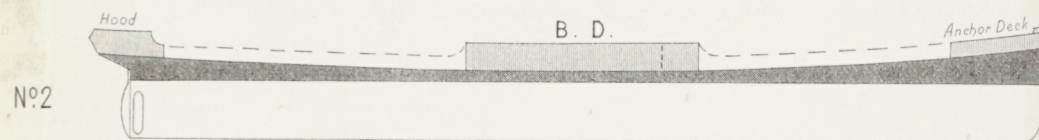
Abg.....Aalborg	Cdz.....Cadiz	H.Kg...Hong Kong	Npt.....Newport	Sil.....Scilly
Abn.....Aberdeen	Cff.....Cardiff	Hpl.....Hartlepool	Nqy... { Newquay, Car-	Skm...Stockholm
Abr.....Aberayron	Chp.....Chepstow	Hrl.....Harlingen	{ diganshire	Sld.....Sunderland
Abs.....Aberystwith	Chs.....Chester	Hul.....Hull	Nry.....Newry	Sli.....Sligo
Adl.....Adelaide	Cly.....Clyde Ports	Hva.....Huelva	N.Sc.....Nova Scotia	Sly.....Sicily
Akb.....Akyab	Cpl.....Constantinople	I.M.....Isle of Man	N.S.W.NewcastleN.S.W	Smg.....Samarang
Alg.....Algiers	Cpn.....Copenhagen	Inv.....Inverness	Nts.....Nantes	Snd.....Sonderhos
All.....Alloa	Crk.....Cork	Ips.....Ipswich	Nwc.....Newcastle	Sng.....Singapore
Ams.....Amsterdam	Cst.....Cronstadt	Jer...Jersey	N.Yk...New York	Sou.....Southampton
Amy.....Amoy	Ctg.....Carthagena	Kgn.....Kingston, Jam.	Odn.....Odense	Spl.....Sebastopol
Anc.....Ancona	C.Tn...Cape Town	Kob.....Kobé, Japan	Opo.....Oporto	Spr.....Sappemeer
Ant.....Antwerp	Cws.....Cowes	Krh.....Kurrachee	Ork...Orkneys	Stk.....Stockton
Apl.....Appledore	Ddn.....Dunedin, N.Z.	La R...La Rochelle	Pad.....Padstow	Stn.....Støtting
Arb.....Arbroath	Dem.....Demerara	Lan.....Lancaster	P.E.I. { Prince Edward	Str...Stranraer
Auk.....Auckland, N.Z.	Dgr.....Dungarvon	Ldy.....Londonderry	{ Island	Sty.....Stornoway
B.As...Buenos Ayres	Dmb.....Dumbarton	Lgn.....Lough	Pet.....Peterhead	Suz.....Suez
Bah.....Bahia	Dnk.....Dunkirk	Lim...Limerick	Phl.....Philadelphia	Svg.....Svendborg
Bal.....Baltimore	Dov.....Dover	Lis.....Lisbon	Pir.....Piræus	Sws.....Swansea
Bar.....Barnmouth	Drt.....Dartmouth	Liv.....Liverpool	Pka.....Pekela	Syd.....Sydney
Bat.....Batavia	Dub.....Dublin	Lly.....Llanelly	Pld.....Portland(O.)	Tgn...Teignmouth
Bbo.....Bilbao	Dun.....Dundee	Lon.....London	Ply.....Plymouth	Tns... { Townsville, I
Bel.....Barcelona	Exr.....Exeter	Lth.....Leith	Pmd...Portmadoc	{ Queensland
Bdg.....Bridgwater	Fal.....Falmouth	Lus.....Lussino	Png.....Penang	Tps.....Topsham
Bdx.....Bordeaux	Fiu.....Fiume	Lwt.....Lowestoft	P.Nl...Port Natal	Tqy.....Torquay
Bel.....Belfast	Foy.....Fowey	Lyn.....Lynn	Pnz.....Penzance	Trg...Taganrog
Bgn.....Bergen, Norway	Gal.....Galway	Lyt.....Lyttelton, N.Z.	Poo.....Poole	Tri.....Trieste
Bhn.....Bremerhaven	Gen.....Genoa	Man.....Manila	Prs.....Preston	Tto.....Toronto
Bid.....Bideford	Gib.....Gibraltar	Mar.....Margate	Pts.....Portsmouth	Ver.....Vancouver Id.
Bla.....Braila	Glr.....Gloucester	Man.....Mauritius	Qbc.....Quebec	Vdm...Veendam
Bly.....Blyth	Gls.....Glasgow	Mch.....Miramichi	Ram.....Ramsgate	Ven...Venice
Bms.....Beaumaris	Gmh.....Grangemouth	Mel.....Melbourne	Rds.....Randers	Vpo.....Valparaiso
Bnf.....Banff	Gms.....Grimsby	Mga.....Malaga	Rga.....Riga	Wbl.....Whitstable
Bng.....Bangor	Gns.....Guernsey	Mil.....Milford	Rgn...Rangoon	Wex.....Wexford
Bom.....Bombay	Goo.....Goole	Mlt.....Malta	Ros.....Rostock	Wey.....Weymouth
Bos.....Boston	Got.....Gothenburg	Mmn...Moulmein	Rot.....Rotterdam	Whn...Whitehaven
Bpl.....Barnstaple	Grk.....Greenock	Mpt.....Maryport	Rou.....Rouen	Wln...Wellington
Bpt.....Bridport	Gro.....Groningen	Msl.....Marseilles	S.Fo...San Francisco	Wls...Wells
Brs.....Bristol	Gtz.....Galatz	Mth.....Monmouth	St.I...St. Ives	Wlv...Wildervank
Brw.....Barrow	Ham.....Hamburg	Mtl.....Montreal	St.J...St. John	Wmn.Wilmington,N.
Bsb.....Brisbane	Har.....Harwich	Mtr.....Montrose	St.M...St. Malo	Wrk...Workington
Bwk.....Berwick	Hav.....Havre	M.Vo...Monte Video	St.P...St. Petersburg	Wtb...Whitby
Bxm.....Brixham	Hay.....Hayle	Nag.....Nagasaki	Sba.....Sourabaya	Wtf...Waterford
Cal.....Calcutta	Hbt.....Hobart	Nap.....Naples	Scr.....Scarborough	Xia...Christiania
Car.....Cardigan	Hfs.....Helsingfors	Ndp.....Nieuwe Diep	Shi.....Shanghai	Yar...Yarmouth
Cbn.....Cheribon	Hfx...Halifax, N.S.	Nhv...Newhaven	Shl... { Shields, N.	Ygh...Youghal
Cbo.....Colombo	Hgt.....Harrington	N.Os...New Orleans	{ Shields, S.	Yka...Yokohama
Cch.....Christchurch	Hgz.....Hoogezand	Npr.....Napier, NZ.	Shm...Shoreham	Zwl...Zwolle

SKETCHES ILLUSTRATING THE DIFFERENT TYPES OF VESSELS
CLASSED IN THE REGISTER BOOK.

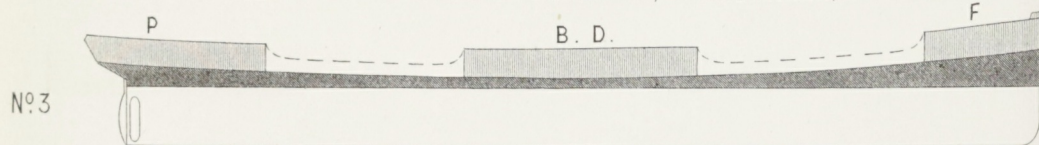
FLUSH DECK VESSEL.



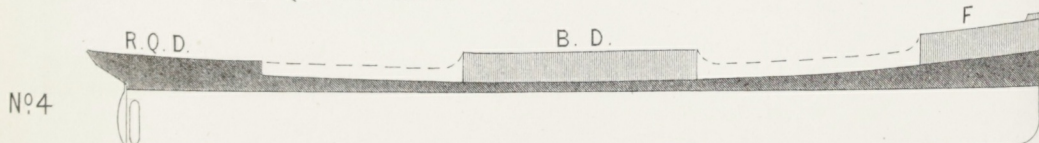
VESSEL HAVING MONKEY FORECASTLE, BRIDGE HOUSE, AND HOOD FOR THE
PROTECTION OF STEERING GEAR.



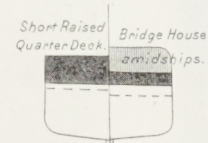
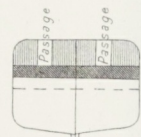
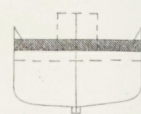
VESSEL HAVING TOP-GALLANT FORECASTLE, BRIDGE HOUSE, AND POOP.



VESSEL HAVING TOP-GALLANT FORECASTLE, BRIDGE HOUSE, AND A SHORT
RAISED QUARTER DECK.

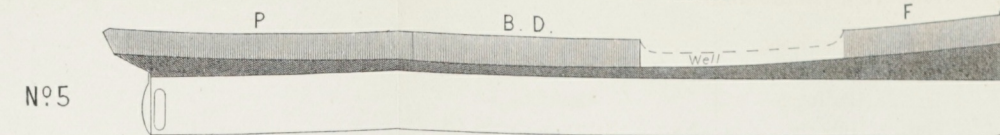


TRANSVERSE
SECTIONS.



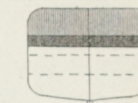
VESSEL HAVING TOP-GALLANT FORECASTLE WITH A LONG POOP AND BRIDGE

HOUSE COMBINED, KNOWN AS A "WELL-DECKED VESSEL"



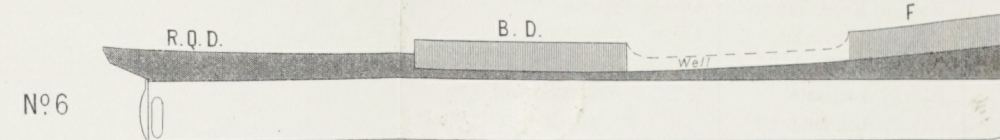
TRANSVERSE
SECTIONS.

Long Poop & Bridge House
combined,
with Iron Bulkhead at end.



VESSEL HAVING TOP-GALLANT FORECASTLE WITH A LONG RAISED QUARTER DECK

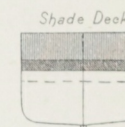
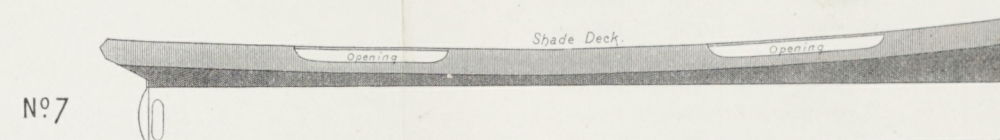
AND BRIDGE HOUSE COMBINED ALSO KNOWN AS A "WELL-DECKED VESSEL"



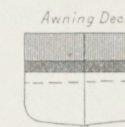
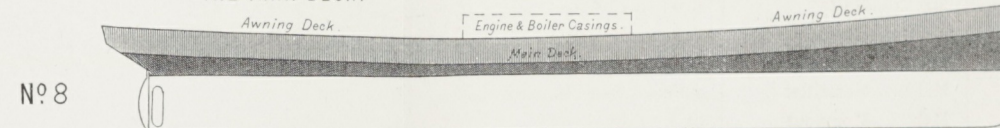
Long Raised
Quarter Deck extending to
Bridge House.



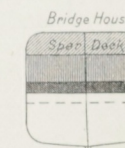
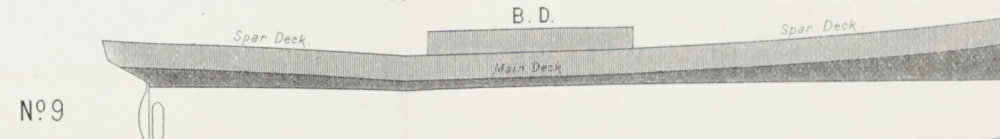
"SHADE DECKED VESSEL" THIS TYPE OF VESSEL HAS A CONTINUOUS UPPER
DECK OF LIGHT CONSTRUCTION AND WITH OPENINGS IN THE SIDES.



"AWNING DECKED VESSEL" THIS TYPE OF VESSEL HAS A CONTINUOUS UPPER
DECK OF LIGHT CONSTRUCTION AND THE SIDES COMPLETELY ENCLOSED ABOVE
THE MAIN DECK.



"SPAR DECKED VESSEL" THIS TYPE OF VESSEL IS CONSTRUCTED WITH THE
SCANTLINGS ABOVE THE MAIN DECK HEAVIER THAN IN AN "AWNING DECKED
VESSEL" BUT NOT SO HEAVY AS IN A "THREE DECKED VESSEL"



PLATES ILLUSTRATING THE DIFFERENT TYPES OF VESSEL
574. CLASSIFIED IN THE REGISTER BOOK

VESSEL HAVING MAST, FORECASTLE, BRIDGE HOUSE AND HOD FOR THE

PROTECTION OF STEERING GEAR

VESSEL HAVING TOP-GALLANT FORECASTLE, BRIDGE HOUSE AND HOD

VESSEL HAVING TOP-GALLANT FORECASTLE, BRIDGE HOUSE AND A SHORT

QUARTER DECK

STATISTICAL TABLES.

STATISTICAL TABLES.

Vessels in the Register Book, 1888-89.

WOOD VESSELS

(INCLUDING COMPOSITE).

Class.	UNITED KINGDOM.		COLONIAL.		FOREIGN.		TOTAL.	
	Number.	Tonnage.	Number	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
23 A	1	1,281	..	....	1	625	2	1,906
20 A	4	3,323	..	....	1	1,054	5	4,377
19 A	31	24,684	3	1,536	7	6,046	41	32,266
18 A	20	23,975	2	361	4	2,847	26	27,183
17 A	20	14,196	2	725	3	2,731	25	17,652
16 A	18	9,049	2	1,655	8	7,661	28	18,365
15 A	44	21,820	4	1,283	19	13,174	67	36,277
14 A	60	16,037	7	3,686	7	3,682	74	23,405
13 A	170	31,889	9	3,486	18	8,902	197	44,277
12 A	387	62,996	10	3,345	48	23,460	445	89,801
11 A	193	33,394	14	4,684	31	21,307	238	59,385
10 A	186	31,594	29	16,690	30	20,699	245	68,983
9 A	145	25,528	42	23,039	25	9,509	212	58,076
8 A	11	1,306	4	1,615	7	1,450	22	4,371
7 A	2	113	..	....	1	325	3	438
6 A	4	586	..	....	..	....	4	586
4 A	1	15	..	....	7	1,323	8	1,338
A	2	56	..	....	4	609	6	665
A	137	23,554	4	1,445	32	14,747	173	39,746
Æ	32	4,803	..	....	2	411	34	5,214
Total } Classed	1,468	330,199	132	63,550	255	140,562	1,855	534,311
Disclasse	1,513	347,391	124	71,775	315	217,911	1,952	637,077
Never } Classed	426	161,565	15	12,444	392	310,016	833	484,025
Gross } Total	3,407	839,155	271	147,769	962	668,489	4,640	1,655,413

SUMMARY OF THE NUMBER, GROSS TONNAGE &c., OF THE VESSELS IN THE REGISTER BOOK, 1888-89.

	IRON.										STEEL.										WOOD (INCLUDING COMPOSITE).						TOTAL.					
	STEAM.					SAIL.					STEAM.					SAIL.																
	UNITED KINGDOM.		COLONIAL.		FOREIGN.		UNITED KINGDOM.		COLONIAL.		FOREIGN.		UNITED KINGDOM.		COLONIAL.		FOREIGN.		UNITED KINGDOM.		COLONIAL.		FOREIGN.									
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.			No.	Tons.	No.	Tons.
CLASSED ..	2,905	3,845,361	98	79,581	703	985,450	1,485	1,781,152	48	43,037	156	141,482	496	984,369	58	63,309	149	217,144	88	135,413	..	..	9	10,515	1,468	330,199	132	63,550	255	140,562	8,050	8,821,214
DISCLASSED	452	632,927	59	47,318	375	446,813	12	9,035	6	4,112	16	12,460	53	116,099	10	7,412	13	14,565	7	2,266	1	1,283	..	..	1,513	347,391	124	71,775	315	217,911	2,956	1,931,367
NEVER CLASSED }	876	744,403	27	19,617	316	511,173	72	31,249	1	871	26	22,821	151	159,617	7	7,885	26	57,935	33	13,456	..	..	..	..	426	161,565	15	12,444	392	310,016	2,368	2,053,052
TOTALS	4,233	5,222,691	184	146,516	1,394	1,943,436	1,569	1,821,436	55	48,020	198	176,763	700	1,260,085	75	73,696	188	289,644	128	151,135	1	1,283	9	10,515	3,407	839,155	271	147,769	962	668,489	13,374	12,805,633

Statement of the number, tonnage, and description of vessels added to the Register of the United Kingdom during the year 1887.

(Prepared from information supplied by the Registrar-General of Shipping.)

A.—NEW VESSELS BUILT IN THE UNITED KINGDOM.

1887.	STEEL.				IRON.				WOOD & COMPOSITE.			
	STEAM.		SAILING.		STEAM.		SAILING.		STEAM.		SAILING.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
JANUARY ..	8	18,600	..	....	3	2,813	2	4,210	..	....	10	670
FEBRUARY ..	8	13,839	4	1,936	4	2,378	1	2,525	4	130	11	601
MARCH.....	20	36,416	5	961	7	2,746	3	4,375	1	15	21	913
APRIL	16	22,305	2	3,661	7	4,254	5	9,697	4	199	12	688
MAY	16	14,940	1	1,685	3	2,613	2	4,222	4	233	20	964
JUNE	17	24,682	..	....	8	4,362	3	5,568	3	75	20	764
JULY	21	29,846	1	1,772	9	1,408	2	1,860	4	173	17	789
AUGUST	16	29,694	5	1,970	1	101	6	6,915	..	....	15	758
SEPTEMBER ..	21	34,187	3	5,307	5	2,895	2	3,909	2	139	12	789
OCTOBER	18	42,042	..	....	4	469	..	....	1	79	9	599
NOVEMBER ..	17	30,201	4	3,260	8	8,329	1	1,698	..	....	13	678
DECEMBER ..	18	29,778	4	5,442	7	7,702	..	....	1	54	10	569
Total	196	326,530	29	25,994	66	40,070	27	44,979	24	1,097	170	8,782

B.—OTHER VESSELS ADDED TO THE REGISTER.

1887.	STEEL.				IRON.				WOOD & COMPOSITE.			
	STEAM.		SAILING.		STEAM.		SAILING.		STEAM.		SAILING.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
New Vessels built abroad..	..	....	..	....	..	....	..	....	1	154	5	443
Other Vessels bought } from abroad .....	..	....	..	....	15	17,859	..	....	3	833	21	9,666
Other Vessels added to } Register	1	1,326	..	....	12	1,667	4	2,260	11	709	73	5,782
Total.....	1	1,326	..	....	27	19,526	4	2,260	15	1,696	99	15,891

SUMMARY.

1887.	STEEL.		IRON.		WOOD & COMPOSITE.		TOTAL.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
STEAM VESSELS..	197	327,856	93	59,596	39	2,793	329	390,245
SAILING VESSELS	29	25,994	31	47,239	269	24,673	329	97,906
Total	226	353,850	124	106,835	308	27,466	658	488,151

The above Statements show a decrease in number of 551 Vessels, and an i

Statement of the number, tonnage, and description of vessels removed from the
Register of the United Kingdom during the year 1887.

(Prepared from information supplied by the Registrar-General of Shipping.)

A.—VESSELS LOST, BROKEN UP, &c.

1887.	STEEL.				IRON.				WOOD & COMPOSITE.			
	STEAM.		SAILING.		STEAM.		SAILING.		STEAM.		SAILING.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
JANUARY	2	2,456	..	....	9	10,244	8	6,892	4	222	94	11,871
FEBRUARY	1	2,143	..	....	21	20,967	7	5,821	3	152	135	15,070
MARCH	1	552	..	....	18	19,747	8	6,037	4	150	63	9,244
APRIL	1	4,493	..	....	8	6,237	4	3,441	3	211	58	9,883
MAY	1	534	..	....	12	7,903	2	1,241	5	371	49	10,472
JUNE .....	..	....	..	....	14	18,440	1	77	2	134	41	6,020
JULY	1	1,363	..	....	13	9,888	4	3,719	4	132	35	9,384
AUGUST .....	..	....	..	....	8	10,790	1	1,264	5	309	32	4,696
SEPTEMBER .....	..	....	..	....	8	8,321	6	6,747	1	65	26	5,794
OCTOBER .....	..	....	..	....	20	19,183	8	10,293	4	172	46	6,588
NOVEMBER .....	..	....	..	....	15	9,423	4	3,929	10	1,480	59	12,555
DECEMBER .....	..	....	..	....	13	13,585	5	6,620	8	588	69	9,855
Total	7	11,541	..	....	159	154,728	58	56,081	53	3,986	707	111,432

B.—OTHER VESSELS REMOVED FROM THE REGISTER.

1887.	STEEL.				IRON.				WOOD & COMPOSITE.			
	STEAM.		SAILING.		STEAM.		SAILING.		STEAM.		SAILING.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
Sold Foreign	13	21,337	..	....	58	50,642	18	15,285	9	1,220	122	57,644
Converted from Sail to } Steam, or Steam to Sail }	..	....	1	169	1	83	..	..	..	....	3	313
Total	13	21,337	1	169	59	50,725	18	15,285	9	1,220	125	57,957

SUMMARY.

1887.	STEEL.		IRON.		WOOD & COMPOSITE.		TOTAL.	
	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).	No.	TONS (Gross).
STEAM VESSELS..	20	32,878	218	205,453	62	5,206	300	243,537
SAILING VESSELS	1	169	76	71,366	832	169,389	909	240,924
Total	21	33,047	294	276,819	894	174,595	1209	484,461

increase in tonnage of 3,690 tons, for the year 1887. (United Kingdom Vessels.)

STATEMENT, Showing the Number, Gross Tonnage, Classes, &c., of the

IRON VESSELS.

STEAMERS.									SAILING SHIPS.								
UNITED KINGDOM.			COLONIAL.		FOREIGN.		TOTAL.		UNITED KINGDOM.			COLONIAL.		FOREIGN.		TOTAL.	
Class.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	Class.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
*A	17	14,212	..	..	3	3,705	20	17,917	*A	437	401,624	18	13,456	66	48,657	521	463,737
A	33	22,859	1	749	6	4,210	40	27,818	A	13	11,689	4	3,152	5	2,973	22	17,814
A	63	47,499	..	..	16	12,489	79	59,988	A	2	1,335	2	1,252	..	..	4	2,587
A	26	17,252	..	..	1	371	27	17,623	A	1	2,138	..	..	..	..	1	2,138
A	28	7,719	7	1,329	13	5,107	48	14,155	A	2	198	..	..	2	801	4	999
100A	1,964	2,897,726	63	60,644	516	820,600	2,543	3,778,970	100A	1,013	1,344,918	24	25,177	79	86,381	1,116	1,456,476
95A	9	6,013	..	..	5	4,755	14	10,768	95A	..	..	..	..	2	1,437	2	1,437
90A	363	309,912	23	12,522	107	90,810	493	413,244	90A	1	344	..	..	1	757	2	1,101
85A	7	3,951	..	..	..	..	7	3,951	85A	..	..	..	..	..	..	..	..
80A	14	10,284	2	2,008	7	3,810	23	16,102	80A	..	..	..	..	..	..	..	..
75A	1	1,314	..	..	..	..	1	1,314	75A	..	..	..	..	..	..	..	..
LvA1*	215	329,355	..	..	16	23,747	231	353,102	LvA1*	12	14,259	..	..	1	476	13	14,735
LvA1*	146	161,379	2	2,329	13	15,846	161	179,554	LvA1*	4	4,647	..	..	..	..	4	4,647
LvA1	19	15,886	..	..	..	..	19	15,886	LvA1	..	..	..	..	..	..	..	..
Total Classed	2,905	3,845,361	98	79,581	703	985,450	3,706	4,910,392	Total Classed	1,485	1,781,152	48	43,037	156	141,482	1,689	1,965,671
Dis- Classed	452	632,927	59	47,318	375	446,813	886	1,127,058	Dis- Classed	12	9,035	6	4,112	16	12,460	34	25,607
Never Classed	876	744,403	27	19,617	316	511,173	1,219	1,275,193	Never Classed	72	31,249	1	871	26	22,821	99	54,941
Gross Total.	4,233	5,222,691	184	146,516	1,394	1,943,436	5,811	7,312,643	Gross Total	1,569	1,821,436	55	48,020	198	176,763	1,822	2,046,219

STEEL VESSELS.

STEAMERS.									SAILING SHIPS.								
UNITED KINGDOM.			COLONIAL.		FOREIGN.		TOTAL.		UNITED KINGDOM.			COLONIAL.		FOREIGN.		TOTAL.	
Class.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	Class.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
100A	426	891,143	44	57,069	119	194,347	589	1,142,559	100A	86	131,173	..	..	9	10,515	95	141,688
95A	1	932	1	224	..	..	2	1,156	95A	..	..	..	..	..	..	..	..
90A	8	2,957	9	4,468	10	5,832	27	13,257	90A	..	..	..	..	..	..	..	..
A	1	443	..	..	..	..	1	443	A	..	..	..	..	..	..	..	..
A	19	11,972	3	1,475	16	10,923	38	24,370	A	..	..	..	..	..	..	..	..
LvA1*	39	75,006	..	..	3	5,107	42	80,113	LvA1*	2	4,240	..	..	..	..	2	4,240
LvA1*	2	1,916	1	163	1	935	4	3,014	LvA1*	..	..	..	..	..	..	..	..
Total Classed	496	984,369	58	63,399	149	217,144	703	1,264,912	Total Classed	88	135,413	..	..	9	10,515	97	145,928
Dis- Classed	53	116,099	10	7,412	13	14,565	76	138,076	Dis- Classed	7	2,266	1	1,283	..	..	8	3,549
Never Classed	151	159,617	7	7,885	26	57,935	184	225,437	Never Classed	33	13,456	..	..	..	..	33	13,456
Gross Total.	700	1,260,085	75	78,696	188	289,644	963	1,628,425	Gross Total	128	151,135	1	1,283	9	10,515	138	162,933

STATEMENT showing the Number, Tonnage, and Description of New Vessels Classed by Lloyd's Register of British and Foreign Shipping during the Year 1887.

WHERE BUILT.	STEEL.				IRON.				WOOD.				TOTAL.	
	STEAM.		SAILING.		STEAM.		SAILING.		STEAM.		SAILING.			
	No.	TONS.	No.	TONS.	No.	TONS.	No.	TONS.	No.	TONS.	No.	TONS.	No.	TONS.
UNITED KINGDOM	192	350,705	13	18,008	59	41,908	28	48,500	6	563	49	4,209	347	463,793
BRITISH COLONIES	.	....	.	....	1	487	.	....	.	....	2	590	3	1,077
AMERICA (UNITED STATES	1	1,151	.	....	.	....	.	....	.	....	.	....	1	1,151
AUSTRIA.....	1	4,070	.	....	.	....	.	....	.	....	.	....	1	4,070
GERMANY	2	3,936	2	2,700	1	140	2	2,739	.	....	6	492	13	10,007
HOLLAND .....	.	....	.	....	1	321	1	417	.	....	.	....	2	738
	196	359,862	15	20,708	62	42,856	31	51,656	6	563	57	5,291	367	480,836

SUMMARY.

	STEEL.		IRON.		WOOD.		TOTAL.	
	No.	TONNAGE (Gross).	No.	TONNAGE (Gross).	No.	TONNAGE (Gross).	No.	TONNAGE (Gross).
STEAM VESSELS..	196	359,862	62	42,856	6	563	264	403,281
SAILING VESSELS	15	20,708	31	51,656	57	5,291	103	77,655
Total	211	380,570	93	94,512	63	5,854	367	480,936

Total Number and Tonnage of NEW VESSELS CLASSED by the Society in 1887:—

637 VESSELS OF 480,936 TONS.

removed from the
1887.

ing.)

**WOOD &
COMPOSITE.**

TEAM.	SAILING.	
	No.	TONS (Gross).
222	94	11,871
152	135	15,070
150	63	9,244
211	58	9,883
371	49	10,472
134	41	6,020
132	35	9,384
309	32	4,696
65	26	5,794
172	46	6,588
1,480	59	12,555
588	69	9,855
3,986	707	111,432

ISTER.

